DETERMINANTS OF E-COMMERCE ADOPTION AMONG MICRO, SMALL AND MEDIUM ENTERPRISES OF PUNJAB

A Thesis

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in

COMMERCE

By

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DECLARATION

I, Harpreet Kaur, student of Ph.D. (Commerce) hereby declare that this thesis entitled '**DETERMINANTS OF E-COMMERCE ADOPTION AMONG MICRO, SMALL AND MEDIUM ENTERPRISES OF PUNJAB**' is an original work done by me and has not been published or submitted elsewhere for the requirement of the degree program. Any literature, data or work done by others and cited within this thesis has been given due acknowledgement and listed in the reference section.

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TO WHOMSOEVER IT MAY CONCERN

I, Dr. Pawan Kumar, do hereby certify that Harpreet Kaur has prepared her thesis entitled **'DETERMINANTS OF E-COMMERCE ADOPTION AMONG MICRO, SMALL AND MEDIUM ENTERPRISES OF PUNJAB'** under my guidance and supervision. This thesis is being submitted by her in the partial fulfillment of the requirements for the award of the Doctor of Philosophy in Commerce from Lovely Professional University, Phagwara.

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ABSTRACT

E-commerce has altered the conventional ways of conducting business and there are tons of success stories regarding the growth and expansion of Micro, Small and Medium Enterprises (MSMEs) through e-commerce adoption in developed economies. This technology is significantly adopted in developed nations and these countries have reaped huge benefits with it. However it has been observed that e-commerce has more scope for developing nations and these countries enjoy gains for much longer term because there is a greater chance to reduce the inefficiency and to increase the productivity in developing nations. But the studies show that the acceptance of ICT and e-commerce in these economies is below the required levels as there is still some hesitation on the part of developing nations to adopt it. Although numerous theories for the understanding of adoption factors of an innovation in an organization have been developed but the spotlight was on the situations prevalent in developed countries. The theories that are framed for developed nations are applicable there only and lose their usefulness in developing nations because there is a huge difference between developed and developing nations of the world regarding the distribution of IT infrastructure. Other reasons include presence of more favorable circumstances in developed nations for adoption of a new technology like advanced ICT infrastructure, higher ICT skills, financial stability, lower cost of internet, etc. Developing economies face tough challenges to adopt e-commerce due to lack of sufficient rules and regulations and poor infrastructure. Due to inadequate research on the adoption factors in developing economies, there is a need for further research in these under-explored areas (Dahbi and Benmoussa, 2019; Ibrahim & Stevens, 2014; Herzallah and Mukhtar, 2016).

Punjab is housed with 206095 MSMEs with Ludhiana, Jalandhar and Amritsar being on the top with more than 50% of the total units of Punjab. The state is trying its best to boost the growth of MSMEs through in-depth studies of ten clusters every year in order to improve their competitiveness. The government of Punjab has set up "MSME-Punjab" to concentrate on the growth and expansion of MSMEs. Its main functions include increasing the competitiveness of MSMEs in the contemporary era, providing support for the up-gradation of technology, etc. E-Commerce can

prove to be a catalyst for increasing the competitiveness of Punjab MSMEs, as the studies have proved that the enterprises which have adopted e-commerce are earning twice than the offline counterparts. Robust infrastructure given by telecom companies with almost 100% coverage catalyzing with high speed 4G connections have placed Punjab at the second place in India after Delhi in terms of its internet subscribers (TRAI, 2019). Punjab has around 76.96 internet subscribers per 100 people as compared to Delhi with 163.65. So far as internet penetration is concerned, Delhi and Punjab stand at 69% and 49% respectively (IAMAI, 2019). The state can take it as a wonderful opportunity to digitally transform its MSMEs as these enterprises constitute around 99% of the total industry of Punjab (Economic and statistical organization of Punjab, 2019-20). This initiative can help boost the GDP of Punjab. So, this research can play a key role in identifying the barriers and facilitators that help and contradict the acceptance process of e-commerce and thus can help in boosting the performance of MSMEs of Punjab.

Research Objectives

Following are the main objectives of the research:

1) To examine the extent of e-commerce adoption in MSMEs of Punjab.
2) To identify the factors influencing the adoption of e-commerce in Punjab MSMEs using a proposed research model.
3) To examine the influencing factors between various stages of e-commerce adoption in MSMEs of Punjab.
4) To study the comparative analysis of e-commerce adoption factors between manufacturing and service enterprises of Punjab.
5) To identify the barriers and facilitators of e-commerce adoption in MSMEs of Punjab.

Hypotheses of the study

Ha 1: Perception of relative advantage of e-commerce is significantly related to the decision to adopt it.

Ha 2: Perception of compatibility of e-commerce is significantly related to the decision to adopt it.

Ha 3: Perception of complexity of e-commerce has inverse and statistically significant relation with its adoption.

Ha 4: Trialability has a significant influence on the decision to adopt e-commerce.

Ha 5: Observability is significantly related to the adoption of e-commerce.

Ha 6: Perception of cost has a significant and inverse effect on the decision to adopt e-commerce.

Ha 7: Security concerns are significantly related to the decision to adopt e-commerce.

Ha 8: Owner's characteristics contribute significantly to the decision to adopt e-commerce.

Ha 9: Organizational e-readiness is a significant contributor to the decision to adopt e-commerce.

Ha 10: Market force influence plays a significant role in the adoption of e-commerce.

Ha 11: Technology vendor support has a significant relation with e-commerce adoption.

Ha 12: Competitive pressure significantly influences the decision to adopt e-commerce.

Ha 13: National e-readiness is a significant contributor to the decision to adopt e-commerce.

Scope of Study

Scope of the study includes the MSMEs of Punjab. Data has been collected from the CEOs/managers of the MSME of Ludhiana, Jalandhar and Amritsar. 384 MSMEs involving 163 Manufacturing and 221 Services sector are included in the study. The key business sectors investigated are hosiery, readymade garments, textile, machine and hand tools, chemical industries, cycle and cycle parts, repair, transport, trade, financial services, etc. The research is focused on the determination of the significant factors affecting the adoption of e-commerce at various stages of adoption of e-commerce in the MSMEs of Punjab.

For this purpose, 43 empirical studies on 22 developing nations were reviewed to classify the diverse variables under thirteen factors viz. relative advantage,

complexity, security, compatibility, cost, observability, trialability, owner's characteristics, organization e-readiness, market force influence, technology vendor support, competitive pressure and national e-readiness. Further various models and theories of technology adoption were reviewed. Following those models all the thirteen factors were classified into three major parts i.e. Technological, Organizational and Environmental using a combination of DOI and TOE model. Combinations of these two models have been studied and validated in earlier studies. Hence a model has been derived which was tested for its validity in context of MSMEs of Punjab.

Research Methodology

In this research, purposive sampling method has been applied. Out of total 22 districts of Punjab three major industrial districts have been selected, based on the number of units. Ludhiana, Amritsar and Jalandhar are the top three districts comprising of half of the total 206095 MSMEs of Punjab. These districts have 59432, 19650, 24855 units respectively, totaling to 103937 MSMEs (Economic and statistical organization of Punjab, 2019-20). Then applying stratified sampling, data was collected proportionately from manufacturing and services enterprises.

In this research, both primary as well as secondary data collection methods have been followed. Primary data regarding the demographic features of the respondents like age, gender, educational qualifications, etc. was collected together with their responses on the statements of three main constructs viz. technological, organizational and environmental. Similarly, for the collection of secondary data, an extensive review of literature concerned with the area of research was done. Specifically, the journal papers and books targeting the determinants of e-commerce adoption in MSMEs were the areas of study. Moreover the literature regarding the e-commerce adoption stages was also considered. Data was also gathered from District Industrial Centres of Ludhiana, Amritsar and Jalandhar. Reports of various renowned organizations concerning MSMEs and e-commerce were studied including the statistical reports and annual reports of MSMEs and other relevant data from the government websites.

Data was analyzed using IBM SPSS Statistics 22 and IBM SPSS AMOS 26 Graphics. Various tests like Descriptive Statistics, means, frequencies, Percentages, Chi-Square, Mann-Whitney U test and Ordinal and Multiple Logistic Regression. Dependent variable was e-commerce adoption levels and independent variables were technological, organizational and environmental factors. Ordinal Logistic Regression was found relevant for the study as the dependent variable was ordinal in nature with different stages of adoption of e-commerce (Lubke and Muthen, 2002).

Findings

First objective: The extent of e-commerce adoption was studied in two ways i.e. in terms of percentage of MSMEs using prescribed electronic functions and the stage level of adoption of e-commerce. Regarding the use of electronic business functions, it was found that sending and receiving business mails was the most popularly used function which was performed by 57.8% of the respondents followed by having websites for just the advertisement of products and services which stood at 44.3%. Online Product and market research was more common as compared to online research on consumer preferences and online research on suppliers. Third party websites were used by just 12.2% of the respondents. Regarding financial transactions, use of EFTs was more popular than the use of smart and credit cards. Advanced level functions like SCM and CRM were not used at present by any respondent. It was seen that as the level of advancement of functions grows, the percentage of MSMEs performing those functions was falling. About the future plan to use these electronic functions less than 10% of the respondents show the positive interest. Regarding the size of enterprises, it was observed that the most common function in medium enterprises was just the advertisement of goods and services through the websites as 71.8% of the respondents from medium enterprises were having their websites for the said purpose. Sending and receiving business e-mails was the most popular business function performed at micro and small level enterprises having 53.6% and 58.5% respondents respectively in its favor. It was also seen that medium enterprises were more active in using the e-commerce applications when comparison was done with micro and small units as the percentage of respondents was high for all the functions in comparison to micro and small business units. On the basis of the type of enterprise, it was seen that online

marketing functions like research on consumer preferences, suppliers, product and market research were slightly more in services enterprises as compared to manufacturing enterprises. 61.3% of the respondents of manufacturing enterprises were sending and receiving business emails as compared to 55.2% in services enterprises. Own websites and third party websites use was slightly more in manufacturing enterprises. Regarding EFT, 43.5% of the respondents from manufacturing enterprises were using this function as compared to 29.8% of the respondents from services enterprises. So, it shows that online marketing was common in services enterprises whereas use of websites, static, interactive or third party websites was more in manufacturing enterprises.

Regarding the stages of adoption of e-commerce it was observed that 35% of the enterprises were non-adopters. They didn't use internet for business and follow only traditional methods of trading. Around 18% were just at e-mail stage, 14% at Static stage, 19% at Interactive stage and finally 12% at Transactive stage. On the basis of the size of the enterprises, it was observed that around 42% of the micro enterprises were non-adopters and the percentage of non-adopters decreases as the size of the enterprise increases as it stands at 32% for small and 20% for medium enterprises. E-mail stage was common with small enterprises because around 23% of small enterprises were at this stage as compared to 19.8% micro and 4.6% medium enterprises. Moreover it was also seen that percentages of MSMEs at Static, Interactive and Transactive stages were more in medium sized enterprises as compared to others with 25% at Static, 32% at Interactive stage and 17% at Transactive stage. On the basis of type of enterprise it was observed that there was no major difference between manufacturing and services enterprises. It was observed that non-adopters were slightly more in case of service enterprises with 37.1% respondents as compared to 33.1% in manufacturing enterprises. Enterprises at Interactive and Transactive Stages were more in manufacturing enterprises with 20.8% and 12.8% respondents as compared to 17.6% and 11.7% of services enterprises at these stages respectively.

Second objective: Regarding the factors influencing the adoption of e-commerce it was found that Relative Advantage, Complexity, Security, Compatibility, Organization e-readiness, Market force influence and Technology vendor support

were significant where Complexity and Security were showing negative coefficients implying negative correlation with the e-commerce adoption.

Third objective: It includes the study the e-commerce influencing factors between various e-commerce adoption stages. For this purpose, comparison within different stages was done in two ways, one is sequential process and the other is non-sequential process, where an enterprise may skip some in-between stages of technology adoption to reach at advanced stages.

In the **sequential stages**, four sequential comparisons were made, Non-Adopters with E-mail stage, E-mail with Static Stage, Static with Interactive Stage and Interactive with Transactive Stage. For interpretation of results, odds ratio (Exp B) were examined. Odds Ratios depict the change in the log odds of dependent variable with a unit change in predictor variable (Hair et al., 2010). The Odds ratios more than one indicate positive relationship whereas ratio less than one indicate negative relationship.

In comparison of Non-Adopters with E-mail stagers, it was found that Complexity and Security were significant factors. Complexity and Security were having odds ratios less than one depicting negative relationship with e-commerce adoption. So a unit increase in complexity and security leads to the negative odds of for a company to be at the higher stage than in non-adopters stage implying that a company prefers to be in lower stages if it fears complexity and security concerns.

For comparison between E-mail and Static Stagers, Observability, Market Force Influence and Technology Vendor Support were found significant.

The comparison between Static and Interactive Stagers indicate that Competitive Pressure was significant.

Lastly, a comparison of Interactive and Transactive Stagers show that Relative Advantage and Compatibility were significant.

For the comparison between **non-sequential stages** of e-commerce adoption, six models were compared i.e. Non-Adopters and Static Stagers, Non-Adopters and Interacitve Stagers, Non-Adopters and Transactive Stagers, E-mail and Interactive Stagers, E-mail and Transactive Stagers and Static and Transactive Stagers.

Comparison of Non-Adopters with MSMEs at Static Stage showed that Compatibility, Observability, Security and Technology Vendor Support were significant.

For Non-Adopters and Transactive Stage, the number of significant factors was the highest. It included Relative Advantage, Complexity, Compatibility, Security, Organizational e-readiness, Market Force Influence. The strongest factor that discriminates between the two is Compatibility, followed by Relative advantage and others.

For E-mail and Interactive stage, Market Force Influence and National e-readiness were significant. It shows that greater the market force influence and stronger the national infrastructure, the probability of being in higher stages of e-commerce adoption will be high.

Again, the comparison of E-mail stage with Transactive stage showed Relative Advantage, compatibility, Organization e-readiness and Market Force Influence as significant factors. Compatibility factor was having more influence than relative advantage, although both were found significant. It means greater the compatibility of e-commerce with culture, work practices, type of business, etc., the greater will be the possibility of being at the advanced levels of e-commerce.

Lastly, Static stage was compared with Transactive stage and the result showed that Relative Advantage, Compatibility, Competitive Pressure are the positive factors, whereas Complexity is deterrent to technology adoption.

Fourth objective: On the basis of type of industry i.e. manufacturing and services enterprises, no significant difference was found between the factors of adoption of e-commerce.

Fifth objective: It includes the identification of facilitators and barriers of adoption of e-commerce. For this purpose, barriers and facilitators were observed in two ways. First, was to observe the overall means and level of significance of factors without taking into consideration various levels of adoption where the output showed that Relative Advantage of Technology, low Complexity and Technology Vendor Support were the facilitators and low Compatibility, Security Concerns, low Market Force Influence, low Organization e-readiness were the obstacles in e-

commerce acceptance. Secondly, barriers as well as facilitators were found for the various levels of e-commerce adoption. It was observed that the same factors that were barriers for MSMEs at a particular stage of adoption of e-commerce were found facilitators for the enterprises at the higher level based on the mean and significant values of factors for that particular stage. Moreover, most of the barriers were faced at Non-Adopters Stage followed by the MSMEs at E-mail stage and so on. The barriers were turning into facilitators as the organization stepped up in the level of technology adoption.

Research contribution and recommendations

This research has contributed both theoretically and practically. Theoretically, it has helped in creating a new model of adoption factors of e-commerce based on the review of literature of studies concerning the e-commerce adoption factors in developing nations. Moreover it has identified the factors that significantly affect the judgment to adopt e-commerce at different stages of e-commerce adoption in MSMEs of Punjab. Practically, it is necessary to thoroughly evaluate a new project before applying it in an organization. So, it will invite the attention of the managers of MSMEs to assess their present level of adoption and to strategically plan for the higher levels until the maturity peak is reached. This study will also benefit academicians and the students as it will provoke the interest in this sphere of study and will also guide for future research. Government will also try to frame policies for the promotion of e-commerce use in these enterprises and thereby raising the GDP of the nation. Government should step forward to enhance the awareness and the understanding of the technology of the owner's and CEOs of these MSMEs through various awareness programs and also various training programs can be organized to make them more skilled. As MSMEs are considered as an engine of the growth of the economy, so programs like Digital India and Skill India should focus more on these MSMEs and ensure their wholehearted participation. There is a need to remove their doubts regarding the security issues, and to financially empower them with easy finance facilities so that they can improve their IT infrastructure. Moreover various incentives schemes in terms of tax exemption on the purchase of ICT products, internet access at low cost, etc. can be framed to enhance the process of technology adoption.

ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS

CEO	—	Chief Executive Officer
CFA	—	Confirmatory Factor Analysis
CR	—	Composite Reliability
CRM	—	Customer Relationship Management
DOI	—	Diffusion of Innovation
EC	—	Electronic Commerce
EFT	—	Electronic Funds Transfer
FAQ	—	Frequently Asked Questions
GDP	—	Gross Domestic Product
GVA	—	Gross Value Added
ICT	—	Information and Communication Technology
IT	—	Information Technology
KPMG	—	Klynveld Peat Marwick Goerdeler
MIS	—	Management Information System
MSMEs	—	Micro, Small and Medium Enterprises
OECD	—	Organization for Economic Co-operation and Development
SCM	—	Supply Chain Management
SME	—	Small and Medium Enterprises
TAM	—	Technology Acceptance Model
TOE	—	Technological, Organizational and Environmental
TPB	—	Theory of Perceived Behavior
TRA	—	Theory of Reasoned Actions
TV	—	Technology Vendors
UTAUT	—	Unified Theory of Acceptance and Use of Technology
VIF	—	Variance Inflation Factor

CHAPTER – 1

INTRODUCTION

This chapter introduces the MSMEs, their contribution to the economy; e-commerce meaning, its benefits, need and its importance; opportunities for MSMEs with e-commerce. It describes the study rationale, outlines the research questions to be answered and explains the scope of the research. The detailed organization of this chapter is as under:

1.1   Research Background

      1.1.1   Indian MSMEs

      1.1.2   E-commerce

1.2   Punjab

      1.2.1   Punjab MSMEs

1.3   Research Motivation

1.4   Statement of the problem

1.5   Scope of Study

1.6   Research Questions

1.7   Structure of the Thesis

1.1   RESEARCH BACKGROUND

With the emergence of e-commerce, there has been a huge alteration in the traditional ways which the business used to follow and there are loads of success stories regarding the growth of MSMEs with the acceptance of e-commerce in developed economies. E-commerce improves the prospects of MSMEs to compete with large organizations at an international level. It also helps in the growth of business due to large benefits through reduced cost (Gareth et al., 2014) thereby acting as a catalyst in providing new opportunities for the growth of MSMEs. It improves the strategic performance of the small businesses and the enterprises with limited finances must make investments in IT after ensuring their fit with their business strategies (Villa et al., 2018).

Many business houses have been compelled to review their present practices and think of introducing new methods which will prove fruitful not only for customers but also for business partners (Oh et al., 2009). The enterprises using e-commerce technology are much ahead of others. They can effortlessly accustom themselves to the needs of the business and can compete better not only in domestic but also in international markets (Confederation of Indian Industry, 2016). The adoption of Information and Communication Technology can bring huge benefits viz. better productivity, improved performance, approaching new markets, improved business processes and the use of new and innovative business channels (Antlova, 2009). E-commerce helps business houses in exploiting unprecedented opportunities and making them more strengthened (Al-Tit, 2020; Villa, et al., 2018). Improved performance at organizational level, customization of products and services as per demand, increase in operational efficiency, 24 hour non-stop trading, minimizing production and labor cost, easy exchange of information through e-commerce help in improving competitive advantage of the business (Alrousan and Jones, 2016; Yaseen et al., 2017; Talukder et al., 2008; Levy & Powell 2003). It has impacted individuals and different organizations in such an intensive way that it surely holds a promising future for all (Al-Qirim, 2007). SMEs can grow by leaps and bounds if they use internet as small businesses adopting e-commerce are earning twice than others (Nathan & FICCI, 2013). E-commerce is the need of the hour to remove the drawbacks of small opportunities and limited strength suffered by SMEs while competing with big giants (Ramdansyah and Taufik, 2017; Cohen & Kallirroi, 2006). Savrul et al. (2014) found that in China, online business has boomed by 120% a year in the last decade whereas in America e-commerce has rocketed from U$ 1.6 bn to U$ 43 bn in the last decade with Brazil holding 59% of the market of Latin America. So, e-commerce has huge prospects of growth as it helps in not only raising the trading efficiency of any economy but also improving its competence level.

There has been a significant embracement of this technology in developed nations and these countries have reaped huge benefits with it. But the studies show that the acceptance of ICT and e-commerce in the developing economies is below the required levels as there is still some hesitation on the part of developing nations to adopt it (Govinage and Sachitra, 2019; Kapurubandara, 2009).

Acceptance of an innovation is based upon a diverse range of factors which influence the decisions of the people either to adopt it or reject it (Ocloo et al., 2018; Fishbein and Ajzen, 1975). Although numerous theories for the understanding of adoption factors of an innovation in an organization have been developed, yet the spotlight was on the situations prevalent in developed countries (Ramdansyah and Taufik, 2017; Alyoubi, 2015; Layne & Lee, 2001; Grandon & Pearson, 2004). The theories that are framed for developed nations are applicable there only and lose their usefulness in developing economies because there is huge difference in the distribution of IT infrastructure among developed and developing nations of the world (Shemi, 2012). Other reasons include presence of more favorable circumstances in developed nations for adoption of a new technology like, higher ICT skills, skilled labor, financial soundness, lower cost of internet, etc. (Kilangi 2012). E-commerce adoption in developing countries is more challenging due to lack of sufficient laws, regulations and poor infrastructure (Al-Somali et al., 2015). Many researchers have underlined that there is a low awareness of EC technology among business houses in developing nations, their employees have low English proficiency and high computer illiteracy which impacts negatively on its adoption (Kshetri 2007; Gibbs and Kraemer, 2004; Layne & Lee, 2001). There is a need to find the causes of low embracement of technology in the developing economies because it has been observed that e-commerce has more scope for developing nations and these countries enjoy gains for much longer term (Terzi, 2011) as there is greater chance of improving the efficiency and the productivity in developing nations (Gawady, 2005). The research done on the adoption factors in developing nations so far is inadequate and it requires further research in these under-explored areas (Dahbi and Benmoussa, 2019; Parker & Castleman, 2009; Shemi, 2012; Ibrahim & Stevens, 2014; Herzallah and Mukhtar, 2016).

1.1.1 Indian MSMEs

Earlier Micro, Small and Medium Enterprises (Manufacturing or Services) were defined by MSMED Act, 2006 on the basis of just their level of investment in Plant and Machinery. There was a difference between manufacturing and services enterprises on the basis of their level of investment as shown below:

Table 1.1: Earlier definition of MSMEs

Classification	Service Enterprises	Manufacturing Enterprises
Micro units	< Rs. 10 Lac	< Rs. 25 Lac
Small units	Rs 10 Lac-2 Crore	Rs 25 Lac-5 Crore
Medium units	Rs 2 Crore- 5 Crore	Rs 5 Crore-10 Crore

(**Source:** Ministry of MSME (2018-19)).

This definition was discouraging these organizations to grow beyond the specified limits as there was fear of losing benefits they were enjoying if they increase their level of investment. Recently, in order to allay this fear of MSMEs, the Union Cabinet has approved the new definition of MSMEs. These enterprises are now being defined on the basis of investment and turnover limits. Investment limit has also been raised which will encourage them to grow without losing benefits enjoyed earlier. However, the new definition of MSMEs does not differentiate between manufacturing and services enterprises as earlier. The detail is as under:

Table 1.2: New definition of MSMEs

Size	Micro	Small	Medium
Investment	<1crore	<10 crore	<50 crore
Turnover	<5 crore	<50 crore	<250 crore

(**Source:** Saluja, 2020.)

MSMEs are one of the most indispensable sectors of India contributing around 30% to GDP, 45% to the total manufacturing output, 40% to India's total exports and employing nearly 110 million persons in more than 63 million units in India (Ministry of MSME, 2018-19). These units are continuously widening their scope by introducing a variety of goods and services to cater to the ever increasing demand from domestic as well as foreign markets. They have been constantly increasing their horizon by inculcating new entrepreneurships through business innovations. They help not only in the development of rural and backward areas but also in

reducing the disparity between urban and rural India and thus ensure equitable distribution of national income. MSMEs also act as ancillary units to large industries, thereby contributing to greater Indian growth story. So, the growth and development of this sector is very much essential for the overall growth and development of the economy.

MSMEs constitute more than 90% of the total industry of most of the economies with micro being the biggest sector in it. In India, the Micro Sector consists of 630.52 lac units, which make above 99% of the total MSMEs of India. The Small units comprise of 3.31 lac, whereas the Medium Sector includes 0.05 lac units which accounts for just 0.52% and 0.007% respectively of the total estimated MSMEs. It can be seen in the table below that micro enterprises are more in rural sector of India as compared to urban sector whereas small and medium enterprises are found in greater number in urban areas as compared to rural ones. Overall, the percentage share of MSMEs in rural areas is 51% as against 49% in urban sector. So these enterprises help in the balanced growth of rural and urban areas.

Table 1.3: Distribution of MSMEs (in lacs)

Sector	Micro	Small	Medium	Total	Share (%)
Urban	306.43	2.53	0.04	309	49
Rural	324.09	0.78	0.01	324.88	51
Total	630.52	3.31	0.05	633.88	100
Share (%)	99.47	0.523	0.007	100	

(**Source:** Ministry of MSME (2018-19))

These enterprises have shown a constant growth in numbers and employment over a period of time. As per the NSS 73rd Round, 2015-16 total number of MSMEs are 633.88 lac which has increased from 361.76 lac in 2006-07 when the Fourth All India Census of MSMEs was conducted and the employment in these units have also increased from 805.24 lac to 1109.89 lac during the referred period.

Table 1.4: Growth of MSMEs

(Lacs)

Parameter	Fourth All India Census of MSMEs, 2006-07	NSS 73rd Round, 2015-16	Annual Compound Growth Rate (%)
Services	246.76	437.23	6.56
Manufacturing	115	196.65	6.14
Employment (Total)	805.24	1109.89	3.63
No of MSMEs (Total)	361.76	633.88	6.43

(**Source:** Ministry of MSME (Annual Report 2018-19))

The table above depicts that the number of services enterprises is more than thrice the number of manufacturing enterprises and thus the employment is more in services sector as compared to manufacturing units of MSMEs in India. Moreover the annual compound growth rate is more in case of services sector in both quantity of units and employment level.

MSMEs can rightly be called as the 'life blood' of our Indian economy as they play a significant role so far as their contribution towards the revenue and employment of the country is concerned. But due to liberalization and globalization, these enterprises are facing tough competition both at national and international level and they need to be competitive to survive and be in tune with the global trends (Government of India, 2010). To face the cut throat competition they need to adopt some new and innovative tools so as to add new customer segments and reach to the customers globally (KPMG and Snapdeal, 2015). Moreover, in the 21st century of technology revolution, globalization and liberation should be taken as an opportunity by MSMEs for it has widened the markets and has enabled the companies to trade across the national boundaries (Bagale, 2014). So, the time has come to give up the traditional modes of trading and be in line with the trends of the era in order to explore the international markets by way of strategic marketing, advanced technology and playing competitively.

1.1.2 E-commerce

The revolution in Information Technology has tremendously changed the way the businesses are conducted. One of such major achievements in the area is the introduction of Electronic Commerce. E-commerce is a latest technology which uses online methods of buying and selling of goods and services and is a strategic weapon to survive and compete not only at national level but also at global level. E-commerce enables a firm to share business information online and conducting of transactions of business through the use of telecommunication networks. The WTO defines e-commerce as the conducting of business functions like production, distribution, marketing and sales of products and services through the use of electronic means. OECD defines e-commerce as the conduct of electronic transactions that includes the processing and transmitting the digital data over open and closed networks. E-commerce is defined as the use of internet and 'WWW' (World Wide Web) for performing the business functions (Grandon and Pearson, 2004). The introduction and the rapid proliferation of internet is making a revolutionary change in the way the businesses are conducted. It has changed the traditional way of 'brick and mortar' trading, where huge funds were invested in physical infrastructure, into electronic way where you can trade virtually from anywhere in the world. E-commerce uses the internet technology to help the sellers and customers to trade in a better and improved way and thus creating a healthier relationship with customers in the process of information exchange. It can be rightly said that e-commerce has emerged through internet and thus e-commerce is the buying and selling of goods and services through computer networks including the internet.

India is making rapid strides towards a digitally transformed economy. Increasing proliferation of smart phones, rising digital transactions, increasing rate of internet subscribers, etc., is propelling India towards a trillion-dollar economy by 2025. Indian e-commerce market is anticipated to arrive at the figure of US$200b till the completion of the year 2026 (PWC, 2018).
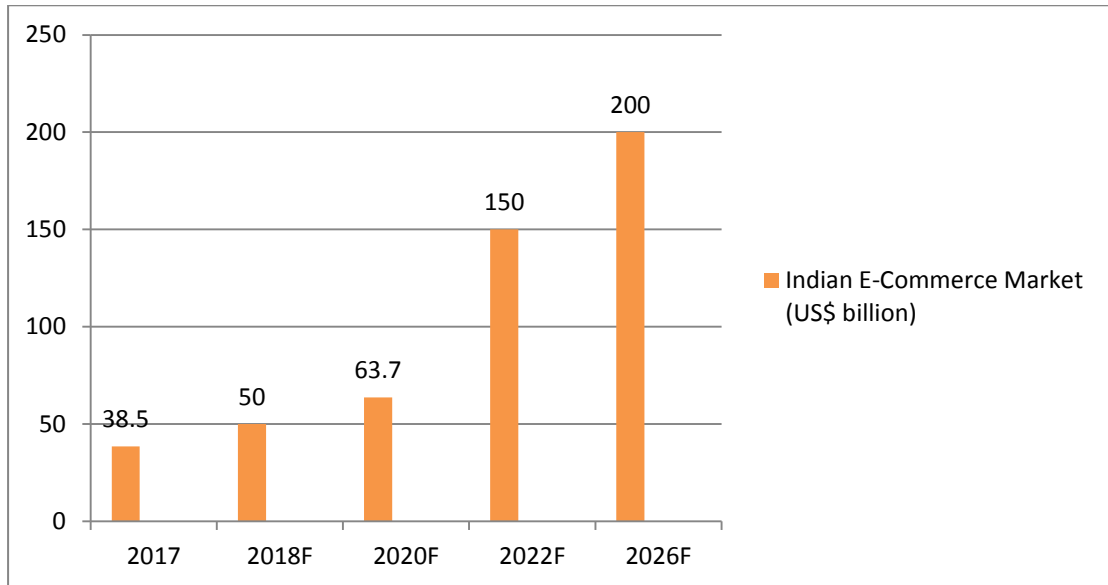
Figure 1.1: Showing Indian e-commerce market (US$ billion)

There are around 4.3 billion internet users worldwide with China being at the top of the list with 854 million internet users followed by India with around 560 million and thirdly with US with 313 million internet users (Internet World Stats, 2020). So, e-commerce has got a huge potential of growth in India and the Indian MSMEs need to grab this opportunity to tap this online market for their products and services. The other catalysts that will add fuel to the fire include the increasing smart phone penetration, 4G Connectivity, affordable data packs, COD options, etc. It is estimated that the revenue from this sector is going to rise to US $ 200 billion by 2026 that was at US $ 39 billion in 2017. It is growing at an annual rate of 51% and that is considered to be the highest in the world. Other opportunities for this sector to sky-rocket in coming years as per IBEF report, 2019 are as follows:

- 100 percent Foreign Direct Investment is allowed in Business-to-Business e-commerce.
- 100 percent FDI is permitted through automatic route in e-commerce marketplace model.
- A good number of Blue Chip Private Equity firms are looking for opportunities in this sector.

- The Indian Government is continuously working hard under its various scheme viz. Digital India, Skill India, etc.

- The Government of India has separated a huge fund to be invested in fiber network for 5G.

- Amazon has announced $1bn investment in MSMEs of India to promote their digitization.

- Huge investment of US$ 6.25 billion has been made in logistics in 2019.

- India is boosting the growth of e-commerce industry by giving an increment of around 10m daily active internet users to it.

There is an unprecedented opportunity tapping at the doors of the MSMEs. It can put these MSMEs on a high growth trajectory. But there is reluctance on the part of Indian MSMEs to adopt these technological innovations as compared to bigger industrial giants in the field. Studies have shown that around 68% of Indian MSMEs are completely offline, 15% are at Connected stage that use internet only for the purpose of communication and gathering of information, 15% are Enabled that have their own websites and only 2% are Engaged who transact online (KPMG and Google, 2017). Also, it has been observed that the year on year growth of profit is the highest in case of Engaged MSMEs.
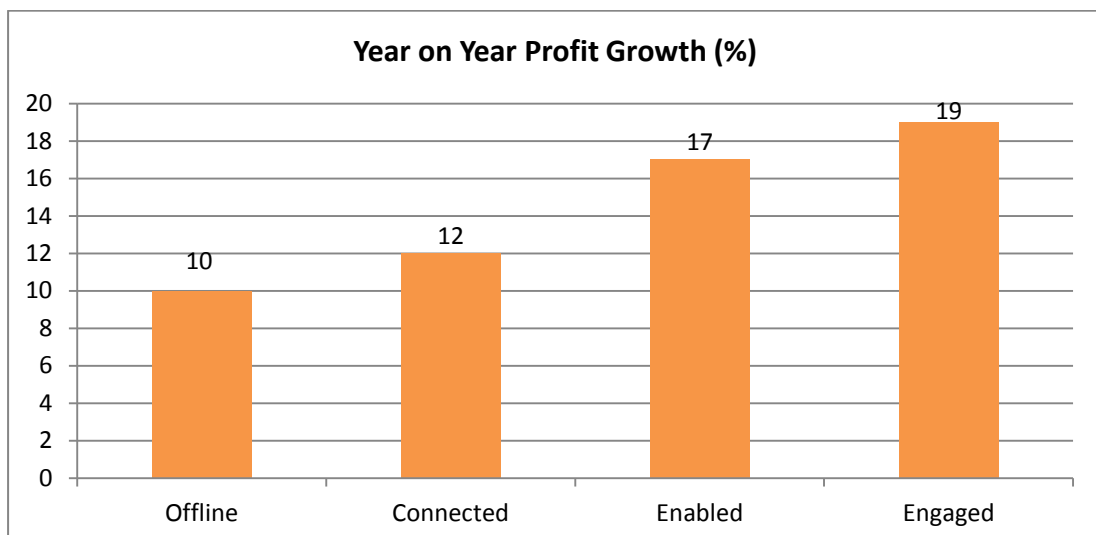
(**Source:** KPMG and Google, 2017)

Figure 1.2: Y-O-Y Profit Growth (%) for the MSMEs at different stages of E-commerce Adoption process

It can be seen from the figure above that the growth in the revenue is highest in case of fully engaged enterprises. But it is a matter of concern that beside numerous advantages of adopting e-commerce, only a handful of these enterprises have embraced this technology fully as can be seen from the table that only 2% of the Indian MSMEs have been able to reach at the stage of full Engagement with e-commerce. Moreover there is also a need to study the various barriers which hinder these MSMEs to go further to reap the full benefits of the technology.

1.2 PUNJAB

Punjab is known as the bread basket of India. Geographically, Punjab is sharing just 1.5% of the total area of India but it contributed more than 25% and 33% of the central pool of rice and wheat respectively in 2018-19 (Economic and Statistical organization of Punjab, 2019-20). Sharing around 26% of the employment, this Primary sector has around 28% share in GVA of Punjab. Agriculture sector not only helps in the growth of the economy but also drives the growth of industrial and service sector of Punjab. The industrial sector is vital for the growth and the development of the economy of Punjab. The share of industrial sector in Punjab's GVA is around 25% and has one third share in the employment of the economy. But the overall leading role both in contribution to GVA and employment of Punjab is played by the services sector. The detail is shown below:

Table 1.5: Sector-wise composition of GVA (2019-20A) and Employment (2017-18)

Sectors	Employment Share (2017-18)	Share in GVA (2019-20A)
Agriculture and Allied activities	26%	28.1%
Industry	33.1%	25.2%
Services	40.9%	46.7%

(**Source:** Economic and Statistical organization of Punjab, 2019-20)

1.2.1 Punjab MSMEs

The economic development of any economy is generally dependent on the growth of the industry. Punjab is performing well in agriculture but the focus is slowly shifting

towards industrialization. Even as per the wisdom of new classical economists, economic development requires economic transformation (Myrdal, 1968; Chenery and Taylor, 1968). A shift is required from agriculture to industry and then industry to tertiary. Thus, for the sustainable growth of an economy, there is a need for simultaneous growth of various sectors. The industry of Punjab is dominated by MSMEs. These enterprises are playing a significant role in the growth and development of Punjab. This sector not only provides huge employment opportunities but also helps in the overall balanced development through industrial progress in the rural and backward areas. Thus, the growth and development of this sector is very crucial for the development of Punjab. Punjab is housing 206095 MSME units (Economic and Statistical organization of Punjab, 2019-20). These units are performing well and value of production of these units has been Rs. 118572 crore in the year 2017-18 increasing at an average rate of 12% between 2015-16 and 2017-18. During the year 2017-18, this sector has added 26683 new units and thereby led to an employment of 1.4 lac people and thereby employing more than 14.8 lac people in these units (Economic and Statistical organization of Punjab, 2019-20). The major industries of Punjab are:

Manufacturing MSMEs	**Services MSMEs**
• **Hosiery and Readymade Garments** • **Textile and Yarn Industry** • **Cycle and Cycle parts** • **Sports goods and Equipments** • **Light Engineering** • **Auto parts** • **Hand tools and Machine Tools** • **Electronics** • **Petro-Chemicals** • **Information Technology** • **Sciences and Pharmaceuticals**	• **Trade and Repair** • **Tourism** • **Transport** • **Storage** • **Telecommunication** • **Financial ond insurance Services** • **Construction** • **Real Estate** • **Hospitality**

(**Source:** Economic and Statistical organization of Punjab, 2019-20)

Figure 1.3: Major MSMEs of Punjab

The table below shows the number of MSME units registered in various districts of Punjab. The number of units is shown in decreasing order with the largest number again in Ludhiana, followed by Jalandhar and then Amritsar. The total number of registered units is 206095.

Table 1.6: Number of Units Registered in Punjab

Serial No.	District	No. of units
1.	Ludhiana	59432
2.	Jalandhar	24855
3.	Amritsar	19650
4.	Sangrur	13488
5.	Patiala	11740
6.	SAS Nagar	11656
7.	Gurdaspur	8467
8.	Hoshiarpur	7643
9.	Bathinda	5939
10.	Moga	5701
11.	Kapurthala	5644
12.	Sri Mukatsar	4150
13.	Fatehgarh	4055
14.	Faridkot	3712
15.	Mansa	3435
16.	Rupnagar	3355
17.	Ferozpur	3314
18.	SBS Nagar	3150
19.	Fazilka	2912
20.	Barnala	2598
21.	Tarn Taran	1199
22.	Pathankot	-
	Total	206095

(**Source:** Economic and Statistical Organisation of Punjab, 2019-20.)

Punjab has got a robust infrastructure for the growth of MSMEs as it has got a broad network of state and national highways, railways, power, skilled labour, innovative entrepreneurs. All these factors promote the expansion of the industry. The largest districts of Punjab are Amritsar, Ludhiana and Jalandhar based on the number of industrial units. Ludhiana has the important industrial clusters like bicycles, hand and machine tools, sewing machines, hosiery, electronic goods, chemicals, rubber goods, products made of plastics, fasteners, screws, etc. Jalandhar is famous for sports goods, leather goods, automobile parts, switch gears, valves, pipes, etc. and Amritsar has various industrial clusters which include textile, agriculture implements, pickles, papad, handicraft items, paints, dyes, printing machinery, etc. These districts also top on the basis of population. The other districts industry is flourishing are Mohali, Batala, Patiala, Phagwara, Hoshiarpur, Kapurthala, etc.

1.3 RESEARCH MOTIVATION

The state is trying its best to boost the growth of MSMEs through in-depth studies of ten clusters every year in order to improve their competitiveness. The government of Punjab has set up "MSME-Punjab" to concentrate on the growth and expansion of MSMEs. Its main functions include increasing the competitiveness of MSMEs in the contemporary era, providing support for the up-gradation of technology, etc.

E-commerce can prove to be a catalyst for improving the competitiveness of MSMEs of Punjab as the studies have proved that the enterprises which have adopted e-commerce are earning twice than the offline counterparts. Robust infrastructure given by telecom companies with almost 100% coverage catalyzing with high speed 4G connections have placed Punjab at the second place in India after Delhi in terms of its internet subscribers (TRAI, 2019). Punjab has 76.96 internet subscribers per 100 people as compared to Delhi with 163.65. So far as internet penetration is concerned Delhi and Punjab stand at 69% and 49% respectively (IAMAI, 2019).

The state can take it as a wonderful opportunity to digitally transform its MSMEs as these enterprises constitute around 99% of the total industry of Punjab (Economic and statistical organization of Punjab, 2019-20). This initiative can help boost the GDP of Punjab. So, this research can play a key role in identifying the factors which

help and contradict the e-commerce acceptance and thus can help in reviving and rejuvenating the MSMEs of Punjab.

1.4 STATEMENT OF THE PROBLEM

In the present technological era, e-commerce is required to sustain and enhance the competitiveness of the MSMEs of Punjab. So this research focuses on two issues. First, it examines the current extent of adoption of e-commerce in MSMEs of Punjab in terms of types of electronic functions performed as well as stage level of e-commerce adoption. Secondly, it finds the factors that support and hinder the embracement of e-commerce at successive stages of adoption in context of Punjab's MSMEs.

1.5 SCOPE OF THE STUDY

The scope of the study includes the MSMEs of Punjab. Data has been collected from the CEOs/managers of the MSME of Ludhiana, Jalandhar and Amritsar. 384 MSMEs involving 163 Manufacturing and 221 Services sector were included in the study. The key business sectors investigated were hosiery, readymade garments, textile, machine and hand tools, chemical industries, cycle and cycle parts, repair, trade, transport, financial services, etc. The research is confined to the determination of the significant factors affecting the e-commerce embracement at various stages of adoption in Punjab's MSMEs. Considering the significance of the MSMEs in the development of a nation and the booster combination of e-commerce with these enterprises, the research will be beneficial to business houses, academicians and government for the formulation of policy regarding the variables that have an effect on the adoption process of e-commerce in MSMEs of Punjab.

1.6 RESEARCH QUESTIONS

Following are the various research questions of the study:

1) What is the current extent of adoption of e-commerce in the MSMEs of Punjab?
2) How the Technological factors affect the e-commerce adoption between different levels of e-commerce adoption?

3) How the Organizational factors affect the e-commerce adoption between different levels of e-commerce adoption?

4) How the Environmental factors affect the e-commerce adoption between different levels of e-commerce adoption?

5) Do the manufacturing and services enterprises differ in terms of the determinants of adoption of e-commerce?

1.7 ORDER OF THE THESIS

Below is the order of various chapters in the thesis:

Chapter 1 - Introduction

It includes introduction of the MSMEs and their contribution to an economy; e-commerce meaning, its benefits, need and its importance; opportunities for MSMEs with e-commerce. It states the study rationale, outlines the research questions and the scope of study.

Chapter 2 - Literature Review

Chapter two reviews the theoretical as well as empirical literature concerning the research area, generates the hypotheses and derives a research model after reviewing the literature. In the theoretical review, various technology adoption models, staged models and theories concerning the e-commerce acceptance have been studied in detail. In the empirical review of the literature, various factors influencing the e-commerce adoption have been deeply studied and classified under different heads viz. technological, organizational and environmental contexts with the help of the literature concerning various researches in developing nations. After the theoretical and empirical review of literature, a research model has been proposed based on combination of TOE and DOI model. This model is combined with staged model derived from the literature which states that technology is adopted in stages starting from non-adopters to fully transformed organizations.

Chapter 3 - Research Methodology

It discusses the research design, population of study, variables in the study and items of survey, research instrument, sample size, sampling technique, and tool of survey, method of data collection and techniques for the analysis of data.

Chapter 4 – Extent of e-commerce adoption in MSMEs of Punjab

This chapter has been divided into two major classifications: Descriptive Statistics and the extent of adoption of e-commerce adoption in Punjab's MSMEs. The first branch contains the information concerning the respondents and the organization. The second branch focuses on the extent of adoption of e-commerce in Punjab's MSMEs. It has been studied through various angles like type of business functions performed electronically; stages of e-commerce adoption viz. Non-adopters, Static stage, Interactive stage, Transactive stage; extent of e-commerce adoption stages both on the basis of type of enterprise as well as the size of the enterprise.

Chapter 5 – Determinants of adoption of e-commerce in Punjab's MSMEs

It indentifies the factors that have an effect on the adoption of e-commerce in Punjab MSMEs, examines the factors that affect the e-commerce adoption between stages, then a comparison of manufacturing and services enterprises have been made in order to find the differences in the factors and finally barriers and facilitators of e-commerce adoption were identified.

Chapter 6 - Discussion

This chapter includes the discussion of the findings.

Chapter 7 - Conclusion and Recommendation

It includes conclusion, limitations, recommendations, contribution and suggestion for future research.

REVIEW OF LITERATURE

INTRODUCTION

This chapter reviews the theoretical as well as empirical literature concerning the research area, generates the hypotheses and derives a research model after reviewing the concerned literature. In the theoretical review, various technology adoption models, concerned theories and staged models concerning the e-commerce embracement have been studied in detail. In the empirical literature review, various factors influencing e-commerce acceptance have been deeply studied and classified under different heads viz. technological, organizational and environmental contexts with the help of the literature concerning the different studies in various developing nations. After the review of theoretical and empirical literature, a research model has been proposed based on combination of TOE and DOI model. This model is combined with staged model derived from the literature which states that technology is adopted in stages starting from simple e-mailing to fully transformed organizations. This chapter has been organized as under:

2.1   Theoretical Models for EC Adoption

2.2   Deriving the Technology Acceptance Model

    2.2.1   Empirical Review of Literature

2.3   Stage Models for EC Adoption

    2.3.1   Deriving the Stages of e-commerce adoption

2.4   Proposed Research Model

2.5   Research Gap

2.1   THEORETICAL MODELS FOR EC ADOPTION

Whenever a new technology is introduced, it gets either accepted or rejected by its users (Fishbein and Ajzen, 1975). There are various causes that have their effect on the decision of the adopters, either to embrace the innovation or to ignore it.

Scholars and researchers from time to time have framed various theories and models that help in the identification of various determinants of the embracement of the e-commerce. These renowned models and concerned theories help in understanding the various causes that affects the decisions of the users to accept or reject the e-commerce which in turn boost the acceptance and the implementation of the technology. Below is the list of the renowned theories that have been followed in various researches. Most of the studies concerning the adoption of e-commerce either used single or a mixture of the below mentioned two or more theories:

1) Diffusion of innovation by Rogers in1962.

2) Theory of Reasoned Action proposed by Fishbein & Ajzen in 1975.

3) Theory of Planned Behavior by Kuhl & Beckmann in 1985.

4) Technology Acceptance Model propounded by Davis in 1989.

5) UTAUT model given by Venkatesh et al. in 2003.

6) Technology-Organization-Environment Model (TOE) by Tornatzky and Fleischer in 1990.

2.1.1 Diffusion of Innovation

Diffusion of Innovation theory popularly known as DOI or IDT was contributed by Rogers which clarifies the rate and stages of technology adoption. It states that diffusion is the procedure and with the passage of time an innovation gets channelized to its potential adopters. These adopters differ in their potential to adopt an innovation. They may be categorized as innovators, early adopters, early majority, late majority and laggards (Rogers, 2010) where innovators are the persons who are the first to adopt an innovations, early adopters are the opinion leaders, early majority includes the persons who rarely lead, late majority are doubtful about the adoption of an innovations and adopt it only after sufficient number of people have already adopted it and laggards come in the final stages to accept an innovation and generally focus on their traditions.

Antecedents   Process   Consequences

Receiver variable
1. Personality characteristics (e.g., general attitude toward change)
2. Social characteristics (e.g., cosmoplitanism)
3. Perceived need for the innovation
4. Etc.

Adoption → Continued adoption / Discontinuance
1. Replacement
2. Disenchantment

Communication sources (Channels)

Knowledge I → Persuasion II → Decision III → Confirmation IV

Social system variables
1. Social system norms
2. Tolerance of deviancy
3. Communication integration
4. Etc.

Perceived characteristics of innovations
1. Relative advantage
2. Compatibility
3. Complexity
4. Triability
5. Observability

Rejection → Later adoption / Continued rejection

Time

(**Source:** Rogers, 2010)

Figure 2.1: Diffusion of Innovation Model

This theory also states that innovation is not accepted immediately. It has to pass through various stages like knowledge, persuasion, decision, implementation and confirmation.

Here knowledge does not mean that there is an understanding of an innovation. It only denotes just an exposure to an innovation. At persuasion stage, he gets the required information. At the decision stage he weighs the pros and cons of adopting an innovation that leads to acceptance or rejection of a technology. Implementation takes place when an innovation is adopted. Confirmation is finalizing the decision of continuing with the innovation.

The theory further states that the rate of adoption is influenced by five beliefs such as Relative advantage, Complexity, Compatibility, Observability, and Trialability (Rogers, 2010).

Relative Advantage: Relative advantage is the scale of perception of technology to be advantageous to a firm. The greater the perception of relative advantage, the higher will be the adoption of technology.

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Complexity: Complexity is the scale of believing an innovation to be hard to understand, learn and to utilize by its users.

Compatibility: Compatibility is taken to be as a scale to which an innovation is believed to be fit with prevalent values, working practices and also the familiarity with the previous experiences of the adopters.

Trialability: It is the scale of trial of an innovation in advance before its adoption. The more the trialability options, the higher is the rate of adoption of a technology.

Observability: Observability is the visibility of the effects of the use of new technology and its communication further to potential adopters.

This theory also has some drawbacks. It does not explain the contextual issues such as limited resources and other organizational contexts for e-commerce adoption in MSMEs (Idris et al., 2017). Further, it does not focus on predicting the behaviors of the individuals regarding the acceptance of an innovation (Al-Mamary et al., 2016).

2.1.2 Theory of Reasoned Actions

Fishbein and Ajzen in 1975 framed the Theory of Reasoned Actions. It is one of the most fundamental theories concerning human behavior and has its roots in social psychology. The theory states that the behavior of a person is based on his behavioral intention. This behavioral intention is dependent on the person's attitude (person's positive or negative feelings or consequential effects of target behavior) and his subjective norms (person's perception that most important people think that he should or should not perform the target behavior (Fishbein and Ajzen, 1975).
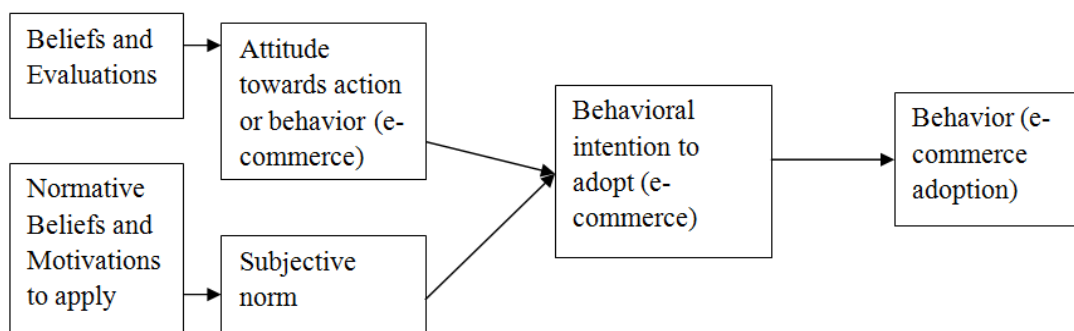
(**Source:** Fishbein and Ajzen, 1975)

Figure 2.2: Theory of Reasoned Actions

This theory explains the effect of attitude, intention and influence of society on a particular behavior. This theory assumes that people behave rationally and take a particular action only after considering its consequences.

Although TRA is well renowned and highly cited theory for researches on human behavior, yet it suffers from some limitations. The assumption of volitional control over a particular behavior is not acceptable because sometimes systemic constraints or limitations may direct a person's behavior (Al-Mamary et al., 2016). This theory also fails to distinguish between attitude and subjective norms (Trafimow, 2009). Both attitude and subjective norms though different in names, may have same constructs as they connote the same thing.

2.1.3 Theory of Planned Behavior

Theory of Planned Behavior was introduced in 1991 by Ajzen to remove some of the limitations of TRA. It can be considered as an extension of TRA. TRA includes two major determinants of a particular behavior, attitude and subjective norms. TPB has an additional factor known as Perceived Behavioral Control which means the perception of whether the performance of a particular behavior is easy or difficult. It is the perception of having a person's control over the performance of a particular behavior.
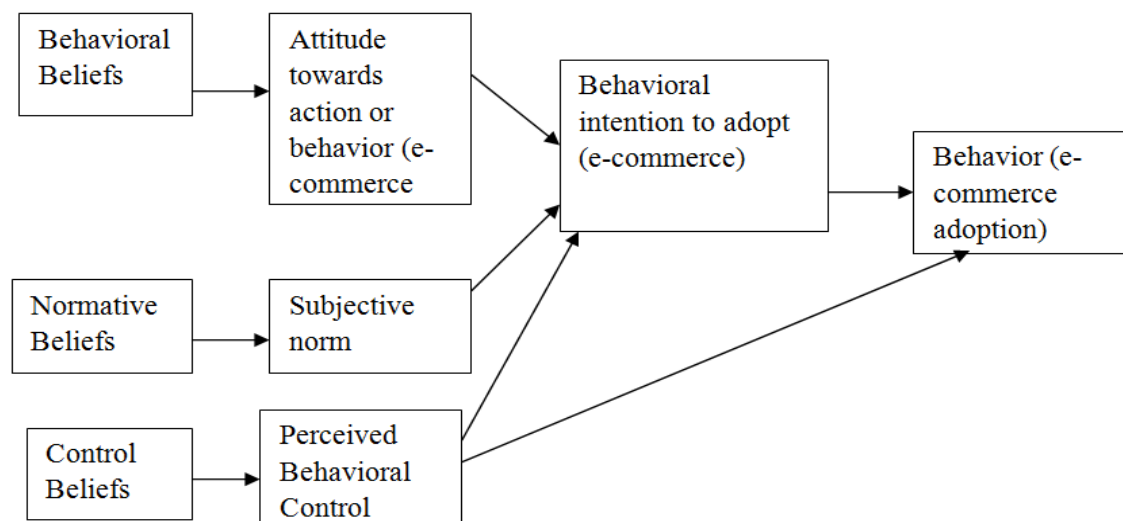
(**Source:** Ajzen & Fishbein, 1980)

Figure 2.3: Theory of Planned Behavior

The more positive a person's attitude towards behavior and subjective norms together with the higher perceived behavioral control, the greater that person's intention will be to perform a particular behavior (Parker and Castleman, 2009).

This theory focuses on mandatory situations, whereas TRA focused only on voluntary situations (Sharma & Chandel, 2013). Although, Theory of Planned Behavior is more effective in predicting the behavior of human beings as compared to Theory of Reasoned Actions (Parker and Castleman, 2009), yet it has some shortcomings.

TPB concentrates only on rational behavior and ignores the behaviors influenced by emotions like sadness, excitement, etc. Also, it studies only specific behavior and thus ignoring general and repetitive behavior (Ajzen & Fishbein, 1980).

2.1.4 Technology Acceptance Model

Technology Acceptance Model popularly known as TAM was developed by Davis in 1989. TAM has most often been used in researches on Information Systems (IS) adoption. It spotlights on the factors concerning the adoption of technology due to which users either accept or reject a technology. Two major factors that affect the decision to adopt the technology adoption are perceived usefulness of the technology and its perceived ease of use. Perceived usefulness means the degree of perception of improvement in job performance with the usage of a technology whereas perceived ease of use is the degree of belief on the technology being free of physical and mental efforts (Idris et al., 2017).
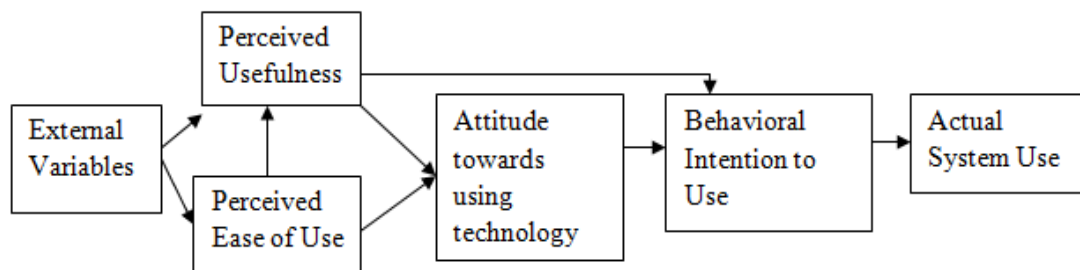
(**Source:** Ajzen and Fishbein, 1980)

Figure 2.4: TAM Model

Both of these factors influence the attitude towards using a technology which in turn affects the behavioral intention and this behavioral intention influences actual usage behavior. TAM states that perceived usefulness and usage behavior has a strong relationship as compared to perceived ease of use and actual usage behavior. The beliefs of the user regarding the usage of a technology may be influenced by certain external factors. This model has its roots in TRA as it has tried to find the relationship between these two determinants and attitude, intention and actual usage of technology (Ajzen and Fishbein, 1980). But there are some differences in TAM and TRA. TRA states that behavioral intention is based on user's attitude and subjective norms whereas TAM states user's attitude is based on perceived ease of use and perceived usefulness factors. Subjective norms have been eliminated in TAM as some researchers found them insignificant predictors (Djatikusumo, 2014).

First extension of TAM popularly known as TAM2 was developed by Venkatesh and Davis in 2000. It is based on the extension of antecedents of Perceived Usefulness as PU was found as a strong determinant of behavioral Intension in many of the empirical tests based on TAM theory. Various theoretical constructs have been added to this modified model which includes Subjective norms, Image, Job relevance, Output quality, Result demonstrability, experience and voluntariness. Later on this model was re-extended by Venkatesh and Bala in 2008 where more focus was on increasing the antecedents of Perceived Ease of Use (PEOU).

TAM is one of the highest cited models in the field of technology adoption (Taherdoost, 2018) but it also suffers from some limitations. TAM model was unsuitable for SMEs as it lacks contextual factors, like infrastructural issues and social influences are missing in this model (Parker and Castleman, 2009). Another weakness of this model is the absence of other important factors that can influence the acceptance of the technology, like management support and training (Djatikusumo, 2014), but still it is considered a powerful and dependable model by many researchers (Sharma and Chandel, 2013). Also it is a significant theoretical contribution to understanding IT adoption and usage (Ajzen and Fishbein, 1980).

2.1.5. UTAUT

UTAUT stands for Unified Theory of Acceptance and Use of Technology. This model was framed by Venkatesh et.al in 2003, who carried on detailed analysis of various renowned technology acceptance theories and derived this UTAUT model that is based on the contributions of those previous theories It consists of four major factors namely, social expectancy, performance expectancy, facilitating conditions and effort expectancy. It also includes four moderators namely age, voluntariness, gender and experience. The figure below shows that the first three factors have direct influence on behavior intentions while the facilitating conditions influence use behavior.
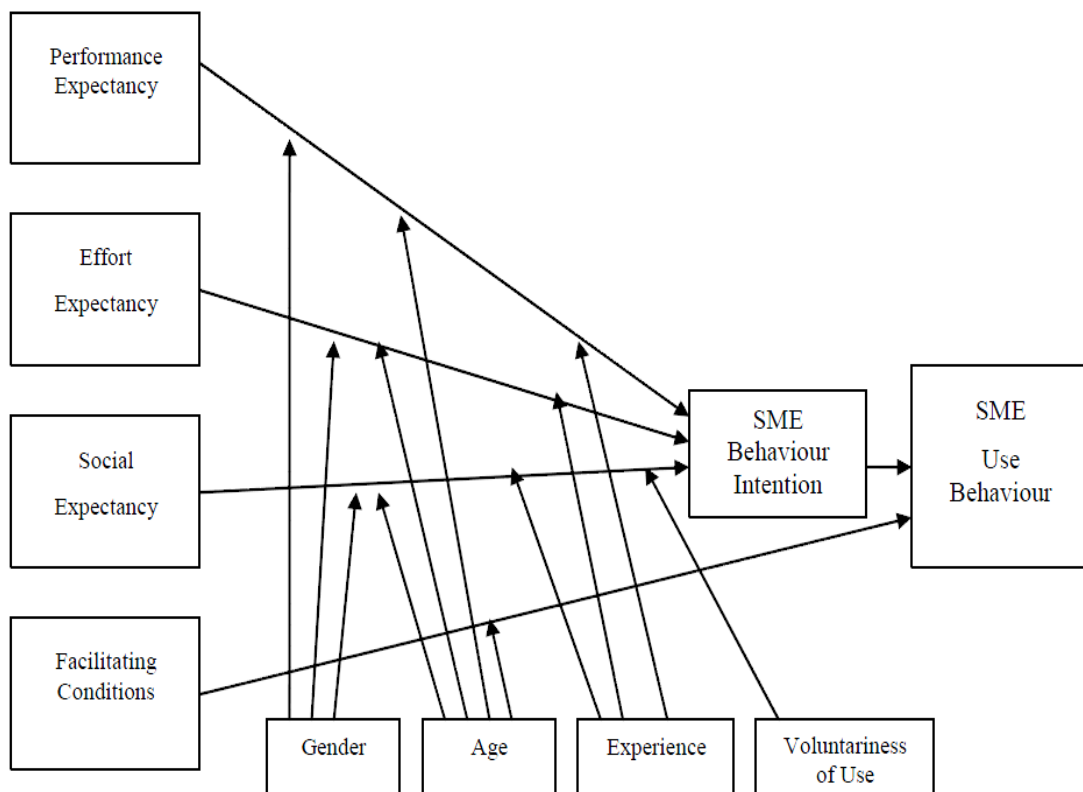
(**Source:** Venkatesh et al., 2008)

Figure 2.5: UTAUT Model

UTAUT model was further extended to UTAUT2 by Venkatesh, Thong and Xu in 2012 to include factors relating to technology use from consumer perspective. UTAUT2 consists of hedonic motivation, price value and habit. From the

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moderating variables of the original UTAUT, Voluntariness of Use variable has been eliminated.

UTAUT has more ability to explain the behavioral intention and the usage of technology as compared to other theories and models (Venkatesh et al. 2003). But some researchers found some flaws in this theory saying that it has more than required number of independent variables for understanding intention and behavior (Bogozzi, 2007). Secondly, it is silent on cultural factors (Djatikusumo, 2014). Thirdly, UTAUT model does not examine external and internal stimuli that influence the intentions over a period of time (Venkatesh et al. 2008).

2.1.6 Technology-Organization-Environment Model (TOE)

Technology-Organization-Environment Model was developed by Tornatzky and Fleischer (1990). It explains that adoption of an innovation is dependent on three factors namely technological, environmental and organizational. Organizational factors include formal and informal methods, communication process and size of an organization. Technological factors include availability of technology and its features, whereas environmental factors consist of government rules and regulations, infrastructure and market structure (Idris et al., 2017).

TOE model has been widely used in both developed and developing countries for studying the factors influencing the innovations adoption and has been considered as a good base for such studies as various researches have tested and validated this model (Ibrahim and Stevens, 2014, Zhu and Kraemer, 2006).

TOE model has been used in various studies concerning information systems, e-commerce and web service adoption (Chiu et al., 2017). A few researchers held the view that this TOE model is needed to be combined with other theories for adding on more constructs in order to have a deeper and better understanding of the adoption behavior (Awa et al., 2011).
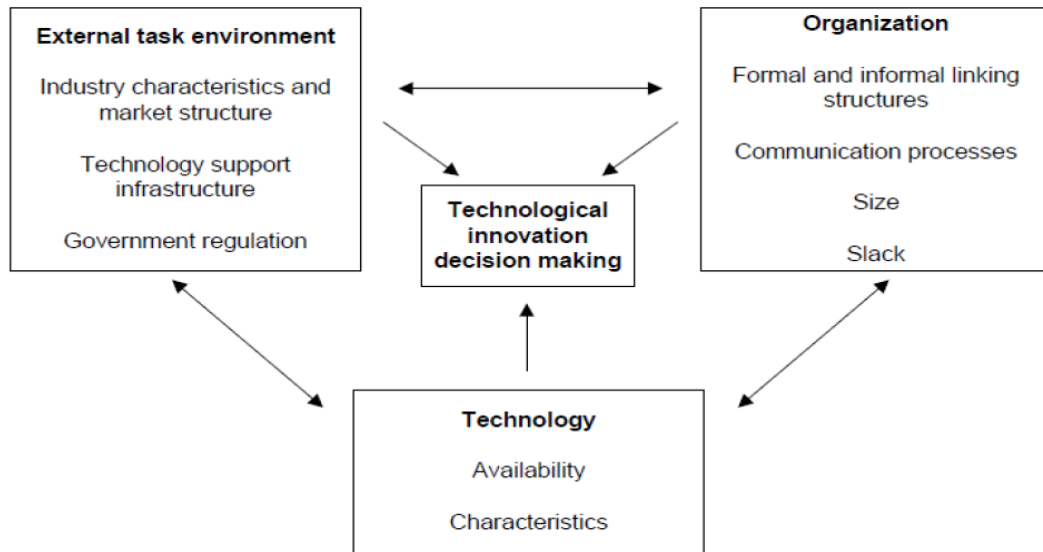
Figure 2.6: TOE Model

In order to understand the applicability and popularity of different theories stated above, 43 empirical studies concerning the technology acceptance factors in developing nations were explored. It was found that out of these 43 studies, 24 studies were using stated models either individually or in combination with one or more models. The following table shows the detail:

Table 2.1: Models used for technology adoption studies

Models	Authors
Diffusion of Innovation (DOI model)	Hashim (2007); Azam and Quadddus (2009); Osorio-Gallego et al(2016)
Technology Acceptance Model (TAM)	Kaynak et al. (2005); Makame et al. (2014)
TAM and DOI combined	Alam et al. (2011); Al-Bakri and Katsioloudes (2015)
Technological, Organizational and Environmental (TOE model)	Seyal et al., (2004); Hazbo-Skoko et al. (2008); Lip-Sam and Hock-Eam (2011), Wanjau et al. (2012), Taylor and Owusu (2012), Rahayu and Day (2015), Chee et al. (2016)
TOE and DOI combined	Hong (2005), Huy and Filiatrault (2006), Le et al. (2012), Kurnia et al. (2015); Ahmad et al. (2015), Ocloo et al. (2018), Al-Somali et al. (2015), Herzallah and Mukhtar (2016)
TAM, DOI, TOE combined	Dlodlo and Dhurup (2013)
TAM and TOE combined	Mahroeian (2012)

The above table shows that the most popular model used for technology acceptance studies is a combination of TOE and DOI model. This supports the suggestion made by some authors that a single theory is insufficient to explain the adoption behavior concerning the adoption of complicated innovation technologies (Oliveira and Martins, 2011; Chiu et al., 2017).

2.2 DERIVING THE TECHNOLOGY ACCEPTANCE MODEL

Various researchers found that DOI theory is most often used with TOE framework. (Chong & Chan, 2012; Hossain & Quaddus, 2011; Picoto et al., 2012). The reason being the independent variables in DOI like internal, external and technological characteristics are similar to TOE's organizational, technological and environmental characteristics (Zhu, Kenneth & Kraemer, 2006). DOI model is more powerful than Theory of Reasoned Actions, Technology Acceptance Model, Theory of Planned Behavior and Unified TAM but it fails to determine the way to gauge the adoption of technology. But this weakness of DOI can be solved by collaborating it with TOE model which consists of Technological, Organizational and Environmental factors (Ochola, 2013). This provides the larger base for studying the adoption behavior better. Therefore, this combined model is considered to be more complete for exploring technology adoption behavior in SMEs (Zhu et al., 2006). DOI united with TOE model is a strong research model and promises a practical outcome in the future researches (Alyoubi, 2015). Usually, literature consists of the studies based on either innovation characteristics or contextual factors. But, a blend of these two theories takes into consideration both innovation characteristics that are derived from DOI model and contextual factors derived from TOE model. (Zhuet al., 2006). Combination of both DOI and TOE has been widely used in studies concerning website adoption, ERP systems, Collaborative Commerce, E-business, Software applications, Internet Based financial EDI, Telemedicine, e-commerce adoption by MSMEs (Chiu et al., 2017).

So, the literature concerning technology adoption factors based on the combination of DOI and TOE models was reviewed and the following factors were derived:

2.2.1 Empirical Review of Literature

2.2.1.1 E-Commerce Adoption Factors in MSMEs

Adoption and utilization of an innovation in an enterprise is influenced by technological, environmental and organizational factors (Tornatzky and Fleischer, 1990; Filiatrult and Huy, 2006). These factors either motivate or hinder the acceptance of technology. These factors are reviewed from literature below:

1)   Relative Advantage: It is the scale of perception of a technology to be beneficial to a firm. The higher the perception of relative advantage, the more will be the pace of technology adoption (Rogers, 2010). When an owner in SME sees more benefits in adopting e-commerce as compared to its related risk, then there is more possibility of its adoption (Ocloo et al., 2018). The existing circumstances improve when an innovation is applied in an organization. Several benefits that can be enjoyed include reduction in costs, convenience, improved satisfaction, saving in time and efforts, increase in operating and marketing efficiency (Al-Tit, 2020; Filiatraut and Huy, 2006). Different researchers have used different terms for relative advantage such as 'perceived usefulness of technology' (Makame et al., 2014); 'Perceived benefits' (Rahayu and Day, 2015; Mahroeian, 2012); 'new business opportunities' (Osorio-Gallego et al., 2016); 'improved job performance' (Dlodlo and Dhurup, 2013). Various researchers that have found this factor as a significant factor of adoption of technology include Ocloo et al. (2018); Garcia-Moreno et al., 2018; Agboh (2015); Taylor and Owusu (2012); Rahayu and Day (2015); Mahroeian (2012); Hashim (2007); Seyal et al. (2004); Herzallah and Mukhtar (2016); Huy and Filiatrault (2006); Al-Somali et al., (2015); Alqahtani et al. (2012); Dlodlo and Dhurup (2013); Kaynak et al. (2005); Hong (2005); Sin.et.al. (2016). But there are other authors that have not found it to be significant (Le et al. 2012; Azam and Quadddus, 2009; Chee et al. 2016). One of the reasons could be that small enterprises are very slow in adoption of e-commerce and thereby there are a few successful stories in small enterprises due to which owners are doubtful of the benefits of an innovation and therefore, are not eager to adopt it (Macharia, 2009).

The differences in the outcomes of the researchers regarding the perception of relative advantage of an innovation as a strong or weak factor gives a research gap

to be explored further in this study. Usually the perception of relative advantage of a technology is assumed to have a significant influence on a decision to adopt a technology, so the hypothesis for the study is as follows:

Ha1: Perception of Relative Advantage of e-commerce is positively and significantly related to the decision to adopt it.

2)   Compatibility: Compatibility is regarded as a scale to which a new technology is considered to be comparable to the present values, morals, customs and work practices of the users (Al-Somali et al., 2015). Various items of survey have been used to measure this factor such as 'compatibility with the type of business' and 'compatibility with the work practices' (Filitrault and Huy, 2006), 'compatibility with the existing IT infrastructure' (Dahbi and Benmoussa, 2019; Agboh, 2015), 'compatibility with the culture of the organization' (Ahmad et al., 2015). When an innovation is found incompatible with the prevalent system, then there are low chances of its adoption as compared to an innovation that is compatible (Rogers, 2010). Various researchers have found compatibility as a significant factor of adoption of technological innovation (Azam and Quadddus, 2009; Mohamed et al., 2018; Shah Alam et al., 2011; Hashim, 2007; Herzallah and Mukhtar, 2016; Huy and Filiatrault 2006; Le et al., 2012; Dlodlo and Dhurup, 2013). But according to some authors, compatibility is not a significant factor that can influence the decision to adopt it (Ocloo et al., 2018; Rahayu and Day, 2015; Mahroeian, 2012). One reason as per Rahayu and Day (2015) is that SMEs in Indonesia are not concerned about integrating their prevalent applications with an innovation because there were very few existing applications. As compatibility of present system with an innovation is generally taken to have an effect on its rate of adoption so the next hypothesis of the research is:

Ha2: Perception of compatibility of e-commerce significantly influences the decision to adopt it.

3)   Complexity: Complexity is the belief of difficulty, toughness in understanding, hardness in the use of an innovation by its users (Rogers 2010). Some innovations are simple to understand, learn and use, while others demand special skills and are tough to learn and use. Some researchers have used the term

'ease of use' instead of complexity (Makame et al., 2014; Dahbi and Benmoussa, 2019; Mahroeian, 2012; Shah Alam et al., 2011). An innovation is taken as complex when, it is not easy to understand by the employees, not simple to use by the related parties (Kapurubandara, 2009), it takes long time to learn (Hashim, 2007), owner does not have knowledge of it (Huy and Filiatrault, 2006). If the user perceives the new innovation to be highly complex, there is more possibility of rejecting it (Mohamed et al., 2018). Higher the complexity of an innovation, the lower will be the capacity to adopt it (Azam and Quadddus, 2009; Agboh, 2015; Mahroeian, 2012; Herzallah and Mukhtar, 2016; Le et al., 2012; Dlodlo and Dhurup, 2013). But Kilangi (2012) was having contradicting results. His findings showed that complexity of an innovation does not have significant influence on the decision to adopt it. So the next hypothesis is:

Ha3: Perception of complexity of e-commerce has statistically significant relation with its adoption.

4)   Trialability: Trialability is the degree to which an innovation can be tried and tested in installments on a limited basis (Rogers, 2010). The innovations that can be experimented have more chances of adoptions than others that are not tried because an adopter gets chances to get familiar with it. Trialability not only helps in the decision to adopt it or not, but also improves the confidence with which the decision is taken (Qashou and Saleh, 2018; Shanmugan, 2019; Hashim, 2007). Hashim (2007) and Alqahtani, et al. (2012) found it to be a significant factor having positive influence on technology adoption. But some authors showed opposite results stating to be insignificant determinant of an innovation adoption (Azam and Quadddus, 2009; Tan et al., 2009). So our next hypothesis is:

Ha4: Trialability has a significant influence on the decision to adopt e-commerce.

5)   Observability: Observability is the degree to which the effects of the use of an innovation is noticeable, observed and communicated to others. Innovation will be embraced quickly when its benefits can be observed by others (Azam and Quadddus, 2009). Also, the more the use of a technology can be communicated to the potential adopters, the more will be the rate of adoption (Rogers, 2010). Technology consists of two parts, one is hardware and the other is software and it is

found that software is less observable than hardware components. So, where innovation of software is dominant as compared to hardware, then that innovation has less chances of adoption (Rogers, 2010). Higher the degree of observability, the higher will be the rate of adoption (Rogers, 2010; Azam and Quadddus, 2009; Qashou and Saleh, 2018; Shanmugan, 2019; Hashim, 2007). So the next hypothesis is:

Ha 5: Observability is significantly related to the adoption of e-commerce.

6) Cost: Cost includes the expenditure incurred on implementation of an innovation and consists of initial primary costs together with operating and maintenance expenses. It is usually said that a business should adopt an innovation only after have complete understanding of its expected benefits in contrast with its cost structure (Kapurubandara, 2009). High cost of investment in technology is an obstacle in its adoption in SMEs of developed as well as developing countries. The lesser the investment in ICT, training cost of employees, cost of maintaining and updating the system, the more will be its rate of adoption (Kwadwo et al., 2016; Saif-Ur-Rehaman and Alam, 2016). Cost is a bigger constraint that affects the decision to adopt e-commerce in MSMEs (Kabanda and Brown, 2015; Al-Tit, 2020; Osorio-Gallego et al., 2016; Macharia, 2009; Alqahtani et al., 2012; Zaied, 2012; Altayyar and Beaumont-Kerridgea, 2016; Oluyinka et al., 2014). Higher the cost of technology, higher will be the rejection rate. So, there is negative and statistically significant relation between cost of technology and its adoption. But two researchers found it to be insignificant (Shah Alam et al., 2011; Rahayu and Day, 2015).

Ha6: Perception of Cost has a significant relationship with the decision to adopt e-commerce.

7) **Security**: Security is the degree to which an innovation is considered to be insecure for conducting online transactions. Security is a major concern in MSMEs while taking decision on the adoption of e-commerce. Insufficient security for online transactions and payments is a great hindrance in e-commerce adoption (Kwadwo et al., 2016). Some don't want to take risk of data hacking, some state that online transactions are highly unreliable (Al-Tit, 2020; Osorio-Galeggo et al., 2016), while others are afraid of viruses in the use of e-commerce (Saif-Ur-Rehaman and Alam,

2016). Higher the security concerns, the lower will be the adoption of e-commerce. Other researchers who found security factor as a major deterrent, include Fathian et al. (2008) and Savrul et al. (2014). But as per the study of some researcher, security concern is not a significant factor to influence the decision to adopt e-commerce (Al-Somali et al., 2015). According to them, other issues like lack of sufficient regulations, human and technical resources in the developing nations were the major issues as compared to security (Molla and Licker, 2004).

Ha7: Security concerns significantly influence the decision to adopt e-commerce.

8)   **Owner's Characteristics**: Owner is the person in whom ultimate decision making power of an enterprise is vested. He is the sole authority who has to take the decisions regarding the financial commitments of his firm (Macharia, 2009). Various items of survey are used to measure this factor. Some of them are 'owner's level of education' (Lip-Sam and Hock-Eam, 2011), 'owner's experience', 'owner's innovativeness and capability', 'owner's ICT understanding', (Rahayu and Day, 2015), 'Owner's or Manager's support' (Garcia-Moreno et al., 2018; Kabanda and Brown, 2015; Chee et al., 2016; Herzallah and Mukhtar, 2016), 'Owner's attitude and intention to growth' and their 'perception of business value of the internet' (Makame et al., 2014). Other major influencers include 'owner's age' and 'owner's gender' (Alnaser et al., 2018; Macharia, 2009); 'owner's level of awareness' and 'owner's risk taking behavior' (Kabanda and Brown, 2015; Solaymani et al., 2012). Many authors in their empirical studies have found owner's characteristics as a major influencing factor on the choice to adopt e-commerce in MSMEs in developing nations (Hazbo Skoko et al., 2008; Al-Somali et al., 2015; Kabanda and Brown, 2015; Taylor and Owusu, 2012; Rahayu and Day,2015; Kapurubandara, 2009; Al-Bakri and Katsioloudes, 2015; Kapurubandara and Lawson, 2014; Huy and Filiatrault, 2006; Le et al., 2012; Solaymani et al., 2012). So the next hypothesis is:

Ha8: Owner's Characterisitics contribute significantly to the decision of e-commerce adoption.

9)   **Organization's e-readiness**: Organization's e-readiness indicates presence of employees technical skill and existence of business assets that help the adoption of e-commerce in MSMEs (Hassen and Svensson, 2014; Macharia, 2009). A variety of

items of survey have been studied in various empirical researches relating to organizational e-readiness. Some of them are; 'availability of financial resources' (Kusumaningtyas and Suwarto, 2015); size of firm (Macharia, 2009; Huy and Filiatrault, 2006),'strategic orientation of the enterprise' (Huy and Filiatrault, 2006) 'availability of IT resources', 'ICT skill of employees', 'governance rules within an organization' (Dahbi and Benmoussa, 2019; Kabanda and Brown, 2015); 'organizational culture', 'employee's receptiveness of new technology', 'adaptability to change' (Seyal et al., 2004; Laosethakul and Boulton, 2007), etc. Organization's e-readiness is a powerful determinant of e-commerce adoption in SMEs of developing nations (Kabanda and Brown, 2015; Azam and Quadddus, 2009; Agboh, 2015; Mahroeian, 2012; Kapurubandara, 2009; Hazbo Skoko et al., 2008; Kurnia et al., Namtembelele and Gopal, 2018; Oluyinka et al., 2014; Shah Alam et al., 2011). But as per the outcome of the studies of some researchers, organizational e-readiness was not a significant influencer in e-commerce adoption (Chee et al., 2016; Sarosa and Underwood, 2005). In one study, employees were not concerned with the adoption or rejection of new technology because they knew that owner will transfer them to other functions within the organization (Sarosa and Underwood, 2005).

Ha9: Organisational e-readiness is a significant contributor to the decision to adopt e-commerce.

10) **Market Force Influence**: Market force consists of trading partners, suppliers and buyers (Al-Somali et al., 2015). Various items of survey that has been explored to understand market force influence include behavior of buyers like tradition of 'touch and feel' before buying a product (Le et al., 2012), customer market size, culture (Le et al., 2012), trust in the system of online trading (Makame et al., 2014); culture of bargaining (Kabanda and Brown, 2015), use of e-commerce by trading partners (Ahmad et al., 2015); pressure of trading partners including customers and suppliers on an organization to adopt e-commerce (Dahbi and Benmoussa, 2019; Al-Somali et al., 2015; Huy and Filiatrault, 2006). Various researchers have found this factor significant (Kabanda and Brown, 2015; Le et al., 2012; Sarosa and Underwood, 2005; Zaied, 2012; Altayyar and Beaumont-Kerridgea, 2016). But

some scholars have not found this factor to be significant (Ocloo et al., 2018; Rahayu and Day, 2015; Mahroeian, 2012).

Ha10: Market Force Influence has a significant influence on the decision to adopt e-commerce.

11) **Technology Vendor Support**: Technology vendors are the persons who provide sufficient support and counseling for facilitating the adoption of technology. They help in analyzing the needs of the business and recommend right infrastructure based on it and also help in its implementation (Saif-Ur-Rehaman and Alam, 2016). Qualified technology vendors promote the adoption of technology as they provide quick solutions and timely advice when needed (Kwadwo et al., 2016; Sarosa and Underwood, 2005). Technology vendors are also relied upon for the required training in the use of technology as well as for their after sales services which helps in the promoting the adoption and use of technology (Dahbi and Benmoussa, 2019; Al-Somali et al., 2015). Support services are required in local regions of SMEs so as to minimize the damage due to malfunctioning of the systems (OECD, 2004). But Al-Qirim (2007) viewed technology vendor support differently. He divided SMEs in three classifications based on their use of technology. These classifications were starters, innovators and extended adopters. He found that technology vendors do not influence starters and innovators but they have a major influencing effect on extended adopters.

Ha11: Technology Vendor Support has a significant relation with the adoption of e-commerce.

12) **Competitive Pressure**: It means that in the industry including the competitors, there is a huge intensity of potential of e-commerce. As the competition amplifies, the firms begin to adopt e-commerce technologies more extensively to gain competitive advantage (Gibbs and Kraemer, 2004). So, the more the competitive pressure within the industry, the higher will be the rate of adoption of e-commerce (Al-Tit, 2020; Ocloo et al., 2018; Sin et al., 2016; Zaied, 2012; Hong, 2005; Altayyar and Beaumont-Kerridgea, 2016; Alnaser et al., 2018; Mahroeian, 2012; Taylor and Owusu, 2012). But some researchers have found the insignificance of the competitive pressure in the decision making process regarding adoption of e-

commerce in SMEs (Rahayu and Day, 2015; Sarosa and Underwood, 2005). So the next hypothesis is:

Ha12: Competitive Pressure significantly influences the decision to adopt e-commerce.

13) **National e-readiness**: National e-readiness comprises of sound rules, laws and policies that protect the online transactions within the parties ensuring more security (Kwadwo et al., 2016; Macharia, 2009; Osorio-Gallego et al., 2016). It also includes the existence of required national infrastructure and government support to ensure the promotion of adoption of e-commerce in small enterprises in developing economies (Osorio-Gallego et al., 2016). The robust the infrastructure the greater is the confidence among firms in the adoption of the technology. SMEs find some hindrances in the adoption of the technology, like, there is an issue of poor internet connections, low internet speed, presence of insufficient ISPs and long power cuts (Dahbi and Benmoussa, 2019; Taylor and Owusu, 2012), low bandwidth (Agboh, 2015), poor telecommunication infrastructure together with its ineffectiveness and lack or reliability (Kabanda and Brown, 2015; Oluyinka et al., 2014). Other barriers include poor logistics like inadequate transport and delivery infrastructure (Kshetri, 2007), underdeveloped electronic financial structure like low use of credit cards and lack of e-banking services (Kapurubandara, 2009). But Le et al. (2012) found insignificant relation of national e-readiness with the adoption of e-commerce by MSMEs. So the next hypothesis is:

Ha13: National e-readiness is a significant contributor to the decision to adopt e-commerce.

Some of the factors were exclusively studied in a particular study and were rarely examined by others, while some variables were frequently analyzed. So, an attempt was to combine all of these factors under some common headings like, some unique factors viz. owner's attitude (Makame et al, 2014), owner's level of education (Lip-Sam and Hock-Eam, 2011), etc. were combined under a common heading of 'Owner's Characteristics'. Likewise, the factors like size of enterprise, IT resources, financial resources, skilled human resources, etc. have been clubbed under 'Organizational e-readiness'.

Table 2.2: List of Research Hypotheses

Ha1:	Perception of Relative advantage of e-commerce has a significant relation with the decision to adopt it.
Ha2:	Perception of Compatibility of the present system with e-commerce significantly influences the decision to adopt it.
Ha3:	Perception of Complexity in the use of e-commerce has statistically significant relation with its adoption.
Ha4:	Trialability has a significant influence on the decision of e-commerce adoption.
Ha5:	Observability has a significant relation with the decision to adopt e-commerce.
Ha6:	Perception of Cost has a significant influence on the willingness of e-commerce adoption.
Ha7:	Security concern has a significant relation with the decision to adopt e-commerce.
Ha8:	Owner's characteristics contribute significantly to the decision to adopt e-commerce.
Ha9:	Organizational e-readiness is a significant contributor to the decision to adopt e-commerce.
Ha10:	Market Force Influence plays a significant role in the decision to adopt e-commerce.
Ha11:	Technology Vendor Support has a significant relation with e-commerce adoption.
Ha12:	Competitive Pressure significantly influences the e-commerce adoption decision.
Ha13:	National e-readiness is a significant contributor to the e-commerce adoption decision.

So, all the diverse variables have been classified under three major factors, i.e., technological, environmental and organizational. The Technological factors include seven variables like relative advantage, observability, trialability, compatibility, security, complexity and cost. First five technological variables are as per DOI model and two variables have been added to it i.e. cost (Osorio-Gallego et al., 2016) and security (Hong, 2005). Organizational factors include owner's characteristics, organizational e-readiness. Here, owner's characteristics have been added to TOE model as many researchers found that owners' awareness, experience, support, risk

taking behavior, etc. help in the embracement of the technology. Moreover, it helps in overcoming the limitation of TOE model as this model does not include the characteristics of owners and employees (Rahayu and Day, 2015). Now, 'organizational factors' include individual characteristics concerning both owners and employees. Environmental factors include technology vendor support (Al-Somali et al., 2015), competitive pressure (Hong, 2005), Market force influence (Ahmad et al., 2015) and national e-readiness (Huy and Filiatrault, 2006).

Determinants of E-Commerce Adoption

TECHNOLOGICAL FACTORS	ORGANIZATIONAL FACTORS	ENVIRONMENTAL FACTORS
Relative Advantage	Owner's Characteristics	Market Force influence
Compatibility	Organizational e-readiness	Technology Vendor Support
Complexity		Competitive Pressure
Trialability		National e-readiness
Observability		
Cost		
Security		
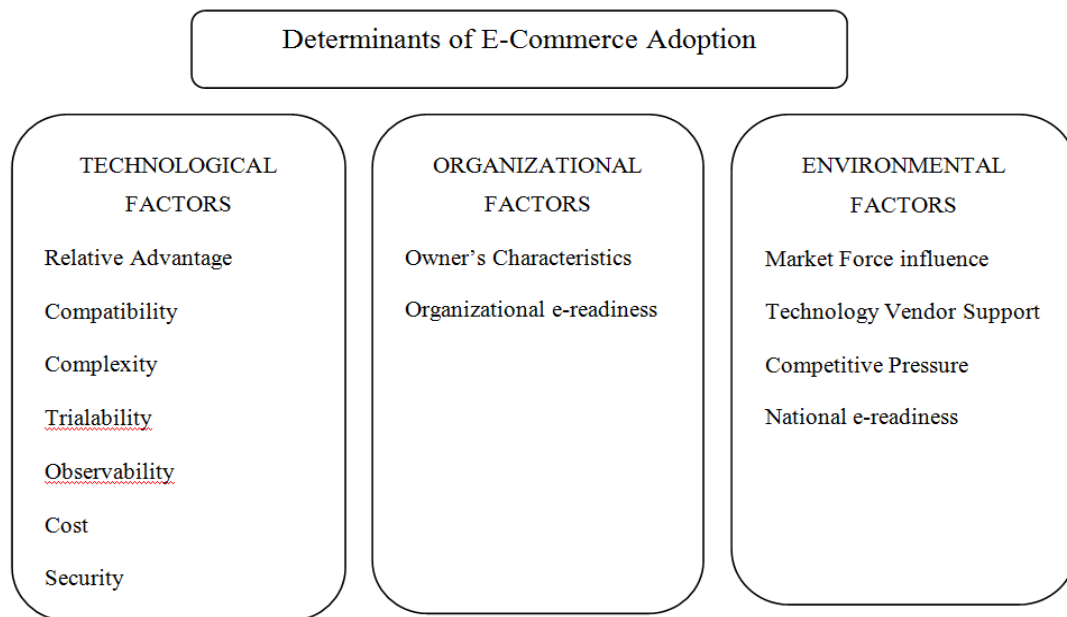
Figure 2.7: Determinants derived from literature based on TOE and DOI model

2.3   STAGE MODELS FOR EC ADOPTION

Technology adoption is usually studied in dichotomy of adopters or non-adopters where either there is an adopter or non-adopter. The case of adopters is considered on single staged basis. However, technology adoption is a multi-staged phenomenon. An organization usually rises in the adoption of the technology from easy and simple applications to more advanced applications. The simplest being the use of e-mails for business and the advanced applications include software like customer relationship management, management information system, etc. (Molla and Licker, 2004). The stage of e-commerce adoption is seldom stable in the longer term. Organizations move to higher stages with time. The staged models provide the better understanding of the factors that may influence in the present use and

progression in use of technology in future (Mendo and Fitzgerald, 2005; Levy and Powell, 2003).

Since the inception of computer technology, various models of IS/IT maturity have been developed. Nolan is considered to be a first researcher to provide a model in the year 1973 to describe the evolution process of IS in organizations (Goncalves, Santos and Morais, 2010). This model was developed long time before the internet and electronic commerce emerged. Nolan's model has been modified from time to time to imbibe the new developments in information technology. Originally, his model consisted of four stages namely: Initiation stage, Contagion Phase, Control Phase and Integration Phases. These phases described the stages of annual changes in computer budget which shows the stages of evolution in computers. Nolan's model was criticized by the researchers for its inadequacy in representing organizational and managerial aspects and for its incapability in reflecting the reality of implementation of information system (Ghachem, 2006). Various renowned researchers have contributed different models concerning the stages of e-commerce adoption to the literature. The table below presents the various models of e-commerce adoption that were contributed by different authors from the year 1999 to 2015:

Table 2.3: E-commerce adoption models presented from the year 1999 till 2015

Researchers	Detail of e-commerce adoption Stages	E-commerce adoption stages
Allcock et al., 1999	-Use of computer without internet -No website but internet is used -E-mails and website for advertisement -Websites that allow interaction like online queries, feedback	Threshold Beginner Intermediate Advanced
McKay et al., 2000	-No internet is used -Advertisement of products and services -Online feedbacks and enquires -Buying and selling is done online -All the internal official functions are integrated -Online links with the business stakeholders are established	No internet Static website Interactive website e-commerce Internal Integration External Integration

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Researchers	Detail of e-commerce adoption Stages	E-commerce adoption stages
Earl, 2000	- Website is used for advertisement	External Communication
	-Different technologies for communication of information used	Internal Communication
	-Buying and selling is done online	e-commerce
	-New models for business developed and processes are re-engineered	e-business
	-Management of processes according to processes followed in business	e-enterprise
	-Business models are modified according to the requirements of the nation	Transformation
DTI, 2001	-E-mails are used	e-mail
	-Advertising of products and services	website
	- Buying and selling is done online	e-commerce
	-Supply chains of the business are incorporated	e-business
	-Online association with various business partners	Transformed Organisation
Rayport and Jowarski, 2002	-Products and services are advertised on the website	Broadcast
	-Online feedbacks and queries attended	Interact
	-Buying and selling is done online	Transact
	-Business partners are collaborated	Collaborate
Stone, 2003	-E-mails, advertising of goods, receiving online queries	Early
	-Processes of business are integrated not internally but externally also	Integrating
	-Advanced websites are use for surviving in technological era	Advanced
Rao et al., 2003	- Advertisement for goods and services	Presence
	-Online feedback, queries, ordering, etc.	Portals
	–Online trading including third party websites	Internal Integration
	-Full integration of business internally as well as externally with various business partners	External Integration

Researchers	Detail of e-commerce adoption Stages	E-commerce adoption stages
Lawson et al., 2003	-Advertising of products and services -Queries and feedbacks online -Transactions are done online, warehouses are electronically linked warehouses	Promotion Provision Processing
Molla and Licker, 2004	-Traditional methods of trading -Use of e-mail for business -Website for advertisement only -Website for online feedbacks, queries, etc. - Transactions are done online -Various stakeholders are integrated online	No internet e-mail Static web Interactive web Transactive web Integrated web
Chen and Queen, 2004	-Use of e-mails for business -Advertisement only -Orders are done using online methods -Business transactions are done online	e-mail Static website Online ordering Online transaction
Al-Qirim, 2007	-emails for business purposes -At least three information technologies are used -Use of advanced technologies like Intranet, Extranet, etc. and thus integrating with stakeholders	Starters Adopters Extended Adopters
Rahman et al., 2013	-e-mails are sent and received for business purposes -Advertising of goods on company website without interaction -Online feedbacks, queries with trading partners, customers, etc. are addressed -Transactions are done online -Collaborations with external parties through online modes.	Pre-Publish Publish Interact Transaction Integration
Al-Somali et al., 2015	-Here e-mails, advertisement of goods and services through websites is done. -Orders, feedbacks and queries are placed online -Integration of web with business stakeholders	Non-Interactive Adoption Interactive Adoption Stabilization

It can be observed that different models concerning the e-commerce adoption present a sequence of adoption of e-commerce ranging from non-adopters till levels of full integration with stakeholders. But, an enterprise does not need to progress through each stage, it may start with any phase and also skip some stages. Generally an enterprise that is aware of the relevance of e-commerce for its business can also begin with an advanced maturity stage thereby by-passing the lower ones (Rao et al., 2003). It can be seen that though the different models of adoption show different number of levels of adoption yet they observe some sequence in reaching to the final stages. Taking into consideration the suggestions of all the authors, a common sequence involves six levels initiating with non-adopters where conventional ways of conducting business without the use of internet are followed. On the next level, an organization starts sending and receiving e-mails for business purposes, following with the use of website which initially is used for advertisement of products and services and then at the next stage there is an advancement in the level of website including the interactive features of online feedbacks, queries, etc. On the next level, an organization can transact online including financial transactions. It also includes the use of third party websites for online transactions. The final level includes the online integration of various parties connected with the business.

2.3.1 Deriving Stages of e-commerce adoption

It is evident from the review of literature that e-commerce adoption requires a path to be followed. Generally, an enterprise advances in the utilization of internet starting with simple e-mails to more complex use that collaborate the systems of the business by re-engineering business processes. It is assumed that the advanced stages of adoption of e-commerce bring more benefits to an organization as compared to the lower stages (Mendo and Fitzgerald, 2005). Enterprises at different stages of e-commerce adoption may face different obstacles (Rao et al., 2003). So, the application of e-commerce maturity model is necessary to have deeper understanding of the factors that affect the different stages of e-commerce maturity (Ghachem, 2006).

A model should have logical evolution of e-commerce adoption with distinct and identifiable stages and each stage to be better than the previous one (Rao et al.,

2003). So, based on the review of literature, a model with six stages of e-commerce has been used in this study. Stage zero depicts Non- Adopters, Stage one is e-mail where business mails are received and sent and organization may involve in online surveys through e-mails, Second stage is static, where an organization has set up e-mails to be used for business or may have static websites that is used only for advertisement of goods and services (Al-Somali et al., 2015). Stage three is depicted as interactive where an organization has an interactive website that receives orders, online inquiries, feedbacks from its customers and suppliers. Stage four is transactive, where online transactions are done that allows for online buying and selling of products with online payments including third-party e-marketplaces (Rao et al., 2003) and the fifth is integrated and includes functions that supports all business processes, connected online with suppliers and trading associates and handles processes such as Customer Relationship Management, supply chain management, etc.

So the model below depicts the distinct and identifiable stages of evolution of e-commerce and can be used as a roadmap by the MSMEs to understand the barriers and the facilitators at each stage of evolution.

Non-Adopters

⬇

e-mail Stage

⬇

Static Stage

⬇

Interactive Stage

⬇

Transactive Stage

⬇

Integrated Stage
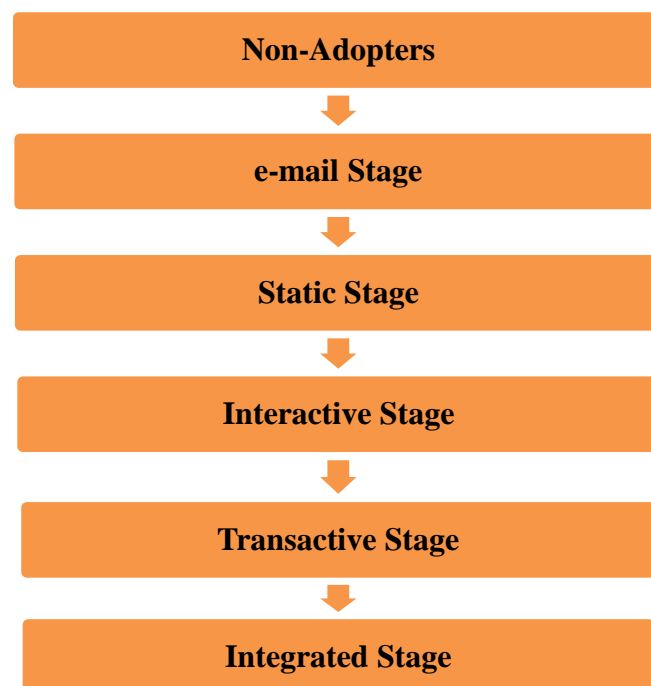
Figure 2.8: Derived Stages of e-commerce adoption

2.4 PROPOSED RESEARCH MODEL

A research model of various determinants of e-commerce adoption has been derived after an extensive review of literature focused on developing nations.
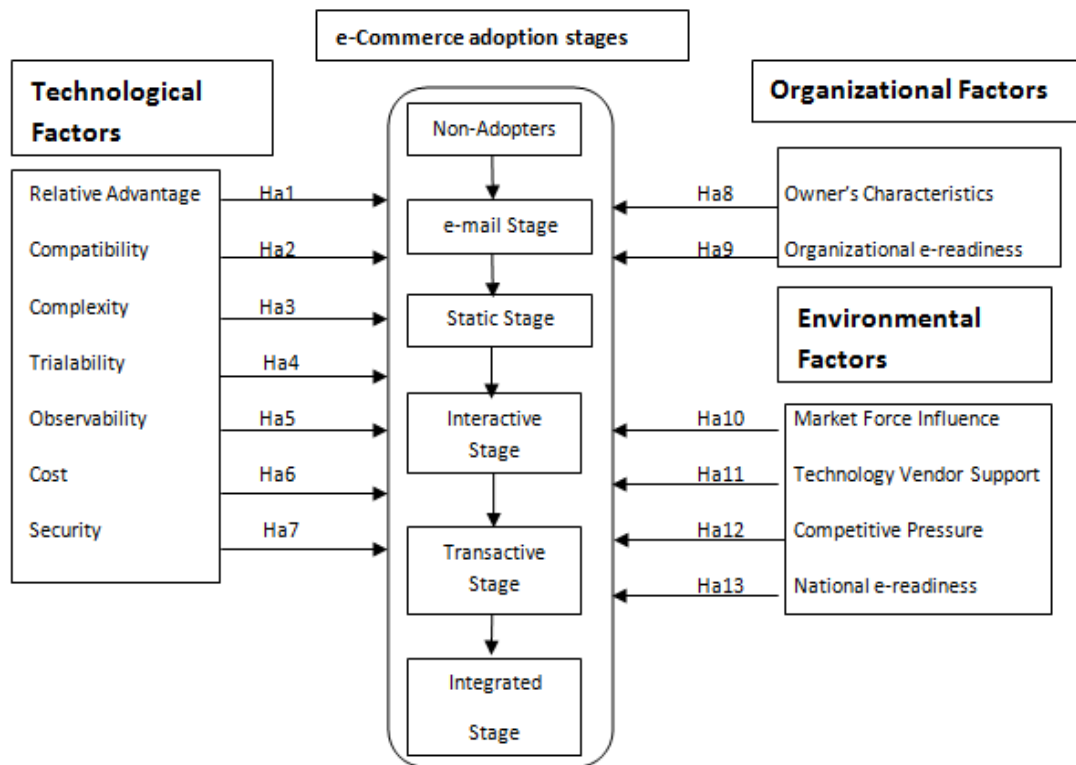
Figure 2.9: Proposed Research Model

This model combines Diffusion of Innovation model with TOE model on one hand together with infusion of staged model on the other hand. This model will help in understanding in detail the various determinants of e-commerce adoption at various stages of its adoption.

2.5 RESEARCH GAP

E-commerce is very essential for the MSMEs in the contemporary era not only to survive but also to compete with the big giants. It has been observed that the enterprises that adopt it are enjoying more profits as compared to their offline counterparts. Studies show that a very few percentage of MSMEs of India are at advanced stages of e-commerce adoption. So there is a need to understand the factors that influence the adoption of e-commerce. Moreover, it was also observed

that technology adoption is a process. An enterprises passes through various stages until it reaches its maturity level. There may be different barriers at different stages. Thus, there is also a need to study various influencing factors at different stages of e-commerce adoption. As this research concentrates on the MSMEs of Punjab, so an effort is needed to help these enterprises to come forward to join the wave in order to improve the growth of the GDP of the state. Opportunities provided by the present circumstances are knocking at the doors of these enterprises to take its benefits. So, there is a need to study the extent of adoption of e-commerce in Punjab MSMEs and to know the factors that affect the decision to adopt the technology in these enterprises at different stages of adoption.

CHAPTER – 3

RESEARCH METHODOLOGY

INTRODUCTION

This chapter describes the methodology of research and includes outlining the research design, sampling size, sampling methods used in the research, sampling technique followed, instrument of research, data collection tools, methods and techniques used for data analysis. This chapter has been organized as follows;

3.1   Need of the Study

3.2   Objectives of Research

3.3   Research Design

3.4   Variables in the study

3.5   Measurement of Constructs

3.6   Pilot testing

3.1   NEED OF THE STUDY

E-commerce can be used as a tool in improving the competitiveness of Punjab's MSMEs because the studies have proved that the enterprises which have adopted e-commerce are earning twice than the offline counterparts (KPMG and Google, 2017). Robust infrastructure given by telecom companies with almost 100% coverage catalyzing with high speed 4G connections have placed Punjab at the second place in India after Delhi in terms of its internet subscribers (TRAI, 2019). Punjab has 76.96 internet subscribers per 100 people as compared to Delhi with 163.65. So far as internet penetration is concerned, Delhi and Punjab stand at 69% and 49% respectively (IAMAI, 2019).

The state can take it as a wonderful opportunity to digitally transform its MSMEs as these enterprises constitute around 99% of the total industry of Punjab (Economic and statistical organization of Punjab, 2019-20). This initiative can help boost the GDP of Punjab. So, this research can play a key role in knowing the factors that help in e-commerce adoption process and thus can help in reviving and rejuvenating the MSMEs of Punjab.

3.2 OBJECTIVES OF RESEARCH

The research fulfills the following objectives:

1) To examine the extent of e-commerce adoption in MSMEs of Punjab.
2) To identify the factors influencing the adoption of e-commerce in Punjab MSMEs using a proposed research model.
3) To examine the influencing factors between various stages of e-commerce adoption in MSMEs of Punjab.
4) To study the comparative analysis of e-commerce adoption factors between manufacturing and service enterprises of Punjab.
5) To identify the barriers and facilitators of e-commerce adoption in MSMEs of Punjab.

3.3 RESEARCH DESIGN

The conventional research design is the outline reflecting the process of research including the operationalization of factors, sample selection, data collection and analysis (Thyer, 1993). It should comprise of planning and strategy formulation for conducting research (Kerlinger, 1986). So, it can be said that the purpose of research design is to plan in advance what study design to be used, how to collect data, how to choose the respondents, the type of observations and their required procedure, analytical techniques to be applied on the quantitative data derived from the observations and communicating the results. It also demands justification for each step with supporting literature (Kumar, 2011). Various research designs are followed and the popular among those are descriptive, exploratory, experimental and explanatory.

Exploratory research design is followed in those research problems which have not been sufficiently explored before or for which no research work have been done. So, they are useful when sufficient knowledge or information is not available for the research problem. Description design is useful when a phenomenon is to be described as it exists. So, here the researchers observes the situation and describes their findings. He answers to the questions which ask how, what, where, when of a research problem. Explanatory research design is applied to explain the reasons or

'why' of the observable fact. The main purpose is to explore something unknown in the universe. The hypothesis in explanatory research design not only states the relationship between two or more variables, but also the effect of one on the other. In this design, the research is always guided by some concepts behind it. Experimental design is used when something is required to be observed under controlled situations. These conditions are not changed until the experiment ends. Here 'control' implies that one factor is held constant and the other is free to vary while the experiment goes on (Akhtar, 2016).

This study follows a combination of descriptive and explanatory research design. This combined research design will help in finding answers to not only what, where, when type of questions but also 'why' type of questions because the study is about the finding of the reasons of low degree of e-commerce adoption in MSMEs of Punjab. As in explanatory studies, the effect of one variable on the other is found, so this research design would help in finding out the effect of Technological, Environmental and Organizational factors on e-commerce adoption.

3.3.1 Study Design

Basically there are two study designs: Qualitative and Quantitative. In this research, quantitative study design has been used. Quantitative research is helpful where sample size is large. So, the more the responses, the greater is the generalization of the results. Quantitative study designs are more precise, structured, controlled and fixed and have been tested for their validity and reliability (Kumar, 2011). Among the various types of quantitative study designs, cross-sectional study design has been used in this research. It refers to investigation of the phenomenon at one time of study. These studies are helpful in understanding the overall view of the research problem at one point of time. Here you define your research problem, select a sample and contact your target population for the collection of data. It is considered cross sectional both for the population under study and the time of study.

3.3.2 Sample size

Sample size of 384 has been calculated with the help of online sample size calculator with 95% confidence level and 5% margin of error.

3.3.3 Sampling Design

Various sampling designs are used for the collection of data. These designs are classified into two major categories i.e. Probability sampling and Non-Probability sampling. Probability sampling is a design in which each and every unit of population has an equal chance of selection. It includes various sub designs like simple random sampling, stratified sampling, cluster sampling, systematic sampling. Non Probability sampling is a design in which each and every unit has no equal chance of being selected. In this research, purposive sampling method has been applied and three major industrial districts of Punjab i.e., Ludhiana, Amritsar and Jalandhar out of total of 22 districts have been selected for the purpose of study. These three districts have 59432, 19650, 24855 units respectively which comprises of around half of the industrial units of Punjab. (Economic and statistical organization of Punjab, 2019-20). The new definition of MSMEs did not affect the results of the survey as the data was taken proportionately from manufacturing and services enterprises and not on the basis of size of enterprises.

3.3.4 Data collection

There are two ways of collecting data. One is to collect it yourself and the other is to use already available data. First approach is known as primary data collection method, whereas the second one is known as secondary approach. Collection of primary data should be carefully planned taking into consideration the objective of the research, characteristics of the respondents, resources of the researcher, etc. Respondents must be familiarized with the research problem and the purpose of the study. They should be well acquainted with the relevance of the research so that they can contribute their maximum to the research. Data collection method should also suit the socio-economic background of the respondents, education level, age, etc. It is due to the fact that some people are not comfortable with a particular method of survey. Some methods require more clarifications from the respondents before responding; similarly, different educational backgrounds of the target population may support some different method. Not only the respondents but the data collection method is also based on the availability of resources and skill of the researcher. Sometimes the method is compromised for the lack of required resources with the

researcher. So, it should be kept in mind that such constraints may affect the quality of data. Secondary data is the data collected by someone else, so there is no need to collect it. It saves time and efforts of the researchers. This type of data may be available from government or semi government publications, data from earlier research, previous records, magazines, internet, etc. This research is based on the use of both primary as well as secondary methods of data collection. Primary data regarding the demographic features of the respondents like the age, gender, educational qualifications, etc. was collected together with their responses on the statements of three main constructs viz. technological, organizational and environmental. Similarly for the collection of secondary data, concerned literature was reviewed extensively. Specifically, the journal papers and books targeting the MSMEs and adoption of e-commerce, prospects of e-commerce, barriers and factors effecting the e-commerce adoption in MSMEs were studied. Moreover, various staged models of e-commerce adoption were also considered. Data was also gathered from District Industrial Centers of Ludhiana, Amritsar and Jalandhar. Reports of various renowned organizations concerning MSMEs and e-commerce were studied. Help was also taken from statistical reports and annual reports of MSMEs and other relevant data from the government websites.

3.3.5 Data Analysis

Data was analyzed using SPSS Software version 22 and various tests like Descriptive Statistics like, means, frequencies, Percentages; Chi-Square; Mann-Whitney U Test and Ordinal and Multiple Logistic Regression were applied. IBM SPSS Amos 26 Graphics was used to check the convergent and discriminant validity of the constructs. Ordinal Logistic Regression is relevant for the research when the outcome variable is either ordinal in nature (Adeleke and Adepoju, 2010). So, it was found appropriate because the dependent variable is ordinal in nature consisting of different stages of adoption of e-commerce. Moreover this technique need not fulfill many assumptions as in case of other techniques (Lubke and Muthen, 2002).

3.3.6 Population and respondents of study

Population of study was the micro, small and medium enterprises of Punjab constituting both manufacturing as well as services enterprises. Among the 22

districts of Punjab, focus of this research was on three main districts i.e. Ludhiana, Jalandhar and Amritsar that are the major industrial districts of Punjab. Moreover, if we divide Punjab in Majha, Malwa and Doaba area, these three districts represent these areas, as Amritsar belongs to Majha, Jalandhar to Doaba and Ludhiana to Malwa area. These three districts are ranked the top three among the total 22 districts of Punjab on the basis of number of MSMEs units is concerned, because around half of the total industries of Punjab are in these three districts. The respondents were the CEOs/managers of the MSMEs as they have full knowledge of their organizations and systems.

3.3.7 Research Instrument

Instrument of research is a method used by the researcher to collect data from the respondents for the purpose of carrying out research. There are various types of research instruments like questionnaire, interview, checklist, observation, etc. In this research, questionnaire instrument has been used for collecting data. Questionnaire is one of the most popular and widely used research instruments. It consists of a series of questions related to the research problem. These are of two types: close ended and open ended. Close ended questions have multiple choices but open ended questions are without fixed set of responses. In this study, questionnaire with close ended questions has been used as a research instrument. Questionnaire was divided into two parts. First half of the questionnaire included demographic and socio-economic questions like type of enterprise, its size, annual turnover, age, gender and educational qualification of the owner, etc. Second half of the questionnaire included the questions concerning e-commerce functions used, factors and stages of adoption of e-commerce based on Likert scale consisting of options of strongly disagree to strongly agree where it allowed the respondents to choose the option most suitable to their opinion. Likert scale questions were assigned to thirteen constructs related to technological, organizational and environmental factors. Each construct had three to seven items of survey related to the particular constructs. These items of survey were supported by the authors in their earlier empirical studies.

3.4 VARIABLES IN THE STUDY

The study consisted of 13 independent classified under technological, organizational and environmental heads and measured on 5 point Likert Scale ranging from Strongly Disagree to Strongly Agree and one multichotomous dependent variable i.e. e-commerce adoption stages having zero to five stages. Predictor variables included factors derived from the TOE and DOI model of technology acceptance.

Table 3.1: Variables used in the research

Research Questions	Predictor variables	Outcome variables
How the Technological factors affect the e-commerce adoption at various levels of adoption?	Relative Advantage Compatibility Complexity Trialability Observability Cost Security	e-commerce adoption levels
How the Organizational factors affect the e-commerce adoption at various levels of adoption?	Owner's Characteristics Organization's e-readiness	e-commerce adoption levels
How the Environmental factors affect the e-commerce adoption at various levels of adoption?	Market Force Influence Competitive Pressure Technology vendor support National e-readiness	e-commerce adoption levels
Do the manufacturing and services units differ on the basis of various determinants of adoption of e-commerce?	Relative Advantage Complexity Compatibility Observability Trialability Security Cost Owner's Characteristics Organization's e-readiness Market Force Influence Competitive Pressure Technology vendor support National e-readiness	Type of Enterprise

Technological factors included seven sub factors: Relative Advantage, Trialability, Complexity, Compatibility, Security, Cost, Observability. There were two sub factors under organizational head: Owner's Characteristics and Organizations' e-readiness while the third division of environmental factors included four sub factors: Market force influence, Competitive pressure, Technology vendor support and National e-readiness. The outcome variable e-commerce adoption stages had total six stages in it: Non-Adopters, E-mail stage, Static, Interactive, Transactive and Integrated stage.

3.5   MEASURING THE CONSTRUCTS

Thirteen constructs were correctly measured and defined to get the trustworthy and valid results. The concerned items were derived from the literature, which measure these constructs. Various authors have used these items in their studies for understanding the factors of technology adoption in a better way. The table 3.2 shows the detail of all the thirteen variables and their related items which measure that particular variable. The last column shows the various authors who have used those items in their study for studying the concerned variables. These measures are as follows:

Table 3.2: Technological Variables

Variables	Item Code	Statement	Sources
Relative Advantage	RELADV1	EC increases profitability	Hong, C.L., 2005
	RELADV2	EC improves the market share for products and services	Al-Somali et al., 2015
	RELADV3	EC provides better access to information	Agboh, 2015
	RELADV4	EC improves job performance	Dlodlo and Dhurup, 2013
	RELADV5	EC provides new business opportunities	Hong, C.L., 2005
	RELADV6	EC is cost efficient	Huy and Filiatrault, 2006
	RELADV7	EC saves time and efforts	Huy and Filiatrault, 2006

Variables	Item Code	Statement	Sources
Compatibility	COMPAT1	EC fits with our type of business	Huy and Filiatrault, 2006
	COMPAT2	EC fits with the current IT infrastructure	Agboh, 2015
	COMPAT3	EC fits with the business values	Al-Somali et al., 2015
	COMPAT4	EC fits with the culture of our organization	Al-Somali et al., 2015
	COMPAT5	EC is compatible with our work practices	Huy and Filiatrault, 2006
Complexity	COMPL1	Use of EC is not easy for our employees	Kapurubandara, 2009
	COMPL2	It takes a long time to learn using EC	Hashim, 2007
	COMPL3	Use of EC is not easy for parties related to the organization	Kapurubandara, 2009
	COMPL4	EC requires different skills	Ahmad et al., 2015
Trialability	TRI1	Trialability (trial) option helps in deciding to adopt EC	Alqahtani et al., 2012
	TRI2	Trialability options will improve my confidence to adopt EC	Hashim, 2007
	TRI3	Nothing much will be lost in trying EC, even if found not useful	Alqahtani et al., 2012
Observability	OBS1	Observing others using EC will help in its adoption	Azam and Quadddus, 2009
	OBS2	Observing others benefitting from EC use will help in its adoption	Azam and Quadddus, 2009
	OBS3	The more the use of EC can be communicated to others the more will be its adoption	Rogers, 2010

Variables	Item Code	Statement	Sources
Cost	COST1	Cost of ICT (system, applications, etc.) for EC is not affordable	Kwadwo et al., 2016
	COST2	Cost of EC installation is high	Kwadwo et al., 2016
	COST3	Cost of Training is expensive	Saif-Ur-Rehaman, & Alam, 2016
	COST4	Cost of maintenance and updating the system is not affordable	Osorio-Gallego et al., 2016
	COST5	Cost of investment in the system is less than the expected return on investment (benefits)	Kapurubandara, 2009
Security	SEC1	EC lacks backing of strong cyber laws	Kwadwo et al., 2016
	SEC2	Lack of sufficient security for online payment and transaction	Kwadwo et al., 2016
	SEC3	Our firm does not want to take risk of hacking of data	Saif-Ur-Rehaman and Alam, 2016
	SEC4	We are afraid of viruses in the use of EC	Saif-Ur-Rehaman and Alam, 2016
	SEC5	EC is considered unreliable by the parties.	Osorio-Gallego et al., 2016

Table 3.3: Organizational Variables

Variables	Item Code	Statement	Sources
Owner's Characteristics	OWNCH1	Owner/CEO awareness of EC benefits helps in its adoption	Kabanda and Brown, 2015
	OWNCH2	Our CEO's level of education effects the adoption of EC	Kabanda and Brown, 2015
	OWNCH3	Our CEO's innovativeness promotes use of EC	Rahayu and Day, 2015
	OWNCH4	CEO's gender effects the adoption of EC	Macharia, 2009
	OWNCH5	CEO's age effects the adoption of EC	Macharia, 2009
	OWNCH6	CEO's risk taking behavior influences the adoption of EC	Huy and Filiatrault, 2006

Variables	Item Code	Statement	Sources
Organizational e-readiness	ORGREAD1	Size of firm effects the adoption of EC	Macharia, 2009
	ORGREAD2	Our organization have the required IT resources	Macharia, 2009
	ORGREAD3	Our organization have the required financial resources	Kusumaningtyas and Suwarto, 2015
	ORGREAD4	Our organization have required skilled human resources	Hassen and Svensson, 2014
	ORGREAD5	The employees of the organization are receptive to new technology	Seyal et al., 2004

Table 3.4: Environmental Variables

Variables	Item Code	Statement	Sources
Market Force Influence	MFINF1	Majority of our Trading Partner have already adopted EC	Ahmad et al., 2015
	MFINF2	Our suppliers and business partners pressurizes us to adopt EC	Ahmad et al., 2015
	MFINF3	Changing customer preferences and lifestyle prompts us to adopt EC	Huy and Filiatrault, 2006
	MFINF4	Culture of trading with EC is prevalent in market	Le et al., 2012
Technology Vendors Support	TVSUPP1	Experienced technology vendors (seller of EC) for developing EC applications are available	Kwadwo et al., 2016
	TVSUPP2	We get sufficient support of technology vendors for EC adoption	Al-Somali et al., 2015
	TVSUPP3	Technology vendors provide us quick solutions of problems when needed	Al-Somali et al., 2015
	TVSUPP4	Timely technical advice given by vendors intensifies the EC adoption	Al-Somali et al., 2015
	TVSUPP5	Technology vendors provide relevant information to us.	Al-Somali et al., 2015

Variables	Item Code	Statement	Sources
Competitive Pressure	COMPRESS1	Intensity (strength) of competition is compelling us to adopt EC	Rahayu and Day, 2015
	COMPRESS2	Enterprises adopting EC become more competitive	Ahmad et. al., 2015
	COMPRESS3	Use of EC by our competitors influence us to adopt it	Hong, C.L., 2005
	COMPRESS4	Benefits derived by our competitors from EC prompt us to adopt it	Ahmad et al., 2015
	COMPRESS5	Pressure from dominant players (big businessmen) improves EC adoption	Ahmad et al., 2015
National e-readiness	NATREAD1	Government is providing adequate support for improving e-commerce adoption	Osorio-Gallego et al., 2016
	NATREAD2	Telecommunication Infrastructure is adequate	Kabanda and Brown, 2015
	NATREAD3	Power Supply is smooth and sufficient to adopt EC	Taylor and Owusu, 2012
	NATREAD4	E-financial system (electronic exchange of funds) is good and reliable	Kapurubandara, 2009
	NATREAD5	Transport and Delivery system is satisfactory	Kshetri, 2007
	NATREAD6	Number of Internet service providers is sufficient	Taylor and Owusu, 2012
Levels of e-commerce adoption	Non-Adopters	No internet is used	Rao et al., 2003
	E-mail Stage	E-mailing is done for business	Chen and Queen, 2004
	Static Stage	Advertisement on own website.	McKay et al, 2004
	Interactive Stage	Online feedback, queries	Al-Somali et al., 2015
	Transative Stage	Online transactions and/or third party websites	Rayport and Jowarski, 2002; Rao et al., 2003
	Integrated Stage	Advanced websites using CRM, SCM, etc	Molla and Licker, 2004

3.6 PILOT TESTING

Pilot survey is one of the crucial steps in the conduct of the research project. It is a sort of mini version of the whole project conducted before starting with the main survey. The purpose of pilot testing is to find the feasibility of the main project and to pretest the research instrument particularly the questionnaire and it is not meant for testing a hypothesis (Peat et al., 2002). A pilot survey indicates the problems in advance that may arise if not sorted before launching the main survey (Edwin and Venora, 2002).

Literature for conducting pilot studies has some guiding points. First, it suggests that the pilot study should be done on nearly 10% of the sample size of the main project (Connelly, 2008). Some authors have different views on sample size for pilot surveys like Ferber and Verdoorn (1962) suggested a sample of 12, Boyd, Westfall and Stasch (1977) recommended 20 and Backstrom and Hursh (1963) suggested 30 as appropriate for the purpose. Secondly, the research instrument should be administered in the same way as it is to be done in the main study (Edwin and Vanora, 2002). Thirdly, the respondents should be representative of the target main population (Thabane et al., 2010). Following the guidelines of the literature, the sample size of 40 MSMEs (around 10% of total 384 sample size) has been used for the purpose of pilot survey.

Reliability test was conducted for finding the internal consistency of measurement scales, for which Cronbach's alpha was calculated. All the values shown by it were more than 0.7. So, the questionnaire was valid as well as reliable for administration to the respondents.

<center>**CHAPTER – 4**</center>

<center># EXTENT OF E-COMMERCE ADOPTION IN MSMEs OF PUNJAB</center>

INTRODUCTION

This chapter has been divided into two major classifications: Descriptive Statistics and the extent of adoption of e-commerce in MSMEs of Punjab. In the initial part information regarding the respondents and the organization is presented. The later part focuses on the extent of adoption of e-commerce in the Punjab's MSMEs. It has been studied through various angles like type of business functions performed electronically; stages of e-commerce; extent of e-commerce stages on the basis of type and size of enterprise.

4.1 Descriptive Statistics

   4.1.1 Profile of Respondents

   4.1.2 Profile of Organizations

4.2 Degree of Association of managerial and organizational characteristics with e-commerce adoption

4.3 Extent of adoption of e-commerce in MSMEs of Punjab

   4.3.1 Business Functions performed electronically

   4.3.2 E-commerce adoption stages

4.1 DESCRIPTIVE STATISTICS

4.1.1 Respondents Profile

This profile consists of the age group, gender, educational qualifications of the respondents.

4.1.1.1 Gender: Gender was broadly classified into two categories consisting of male and female. It was found the male respondents were much larger in number as compared to female respondents. Male respondents were 93% whereas female respondents were just around 6%. The detail is as below:

<center>58</center>

Table 4.1: Showing frequency and percentage of respondents of a particular gender

Gender	Frequency	Percent
Male	358	93.2
Female	26	6.8
Total	384	100

4.1.1.2 Age: Respondents were categorized into four parts on the basis of their age viz. below 25 years, 25 to 40 years, 41 to 60 years and above 60 years.
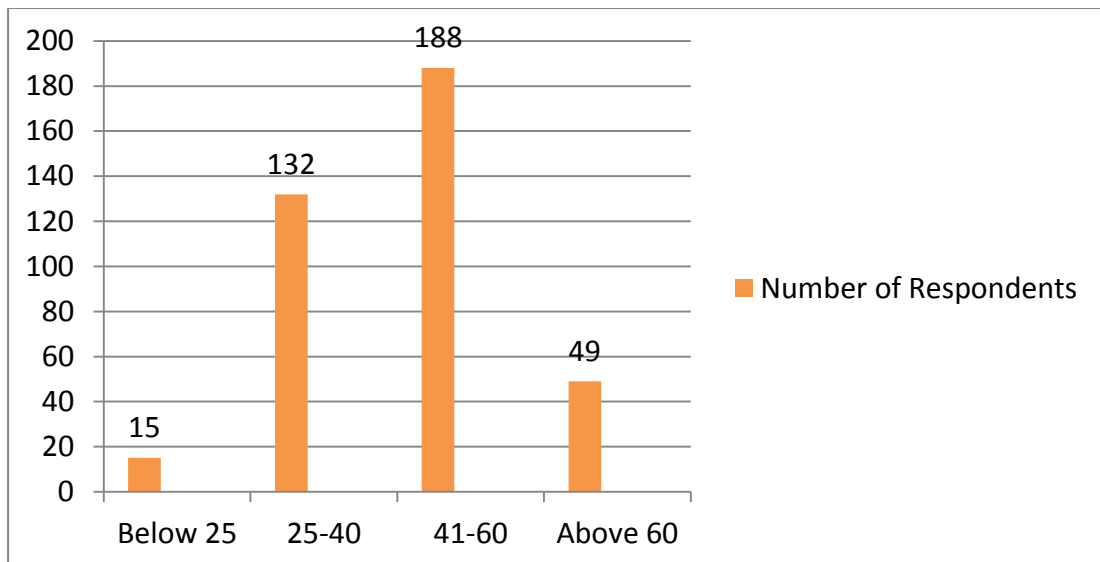
Figure 4.1: Showing the frequency of the respondents in various age categories

It was found that the age group of 41-60 years was most prevalent which stands around 50% of the sample size followed by the age group of 25-40 years which was around 35% of the total sample size, whereas the smallest category was of the respondents was below 25 years holding just 4% of the sample collected.

4.1.1.3 Qualification: The Qualification of the respondents was divided into six parts consisting of without any education, below Matric, Matric, 10+2, Graduation, Post Graduation. It was found that around 45% of the respondents were graduates followed by 34% with 10+2. Around 10% were with Post Graduation.

Table 4.2: Showing the frequency and percentage of the respondents in a particular Qualification category

Qualification Category	Frequency	Percent
None	1	.3
Below Matric	6	1.6
Matric	37	9.6
10+2	129	33.6
Graduation	174	45.3
Post-Graduation	37	9.6
Total	**384**	**100.0**

4.1.2   Organizational Profile

Organizational profile shows the type and size of enterprises covered under the study, together with other information like, the age of the firm, investment, annual turnover, length of adoption of e-commerce.

4.1.2.1 Distribution of MSMEs according to size, type and location: The table shows the distribution of MSMEs of Punjab divided into three major categories: size of enterprise, type and location of enterprise. It was found that 192 enterprises were micro in nature divided into 80 manufacturing and 112 services enterprises, 128 enterprises were small divided into 58 manufacturing and 70 services and 64 medium enterprises divided into 25 manufacturing and 39 services sector. The total number of manufacturing enterprises was 163 and services enterprises were 221. On the basis of location, 219 MSMEs belong to Ludhiana, 92 to Jalandhar and 73 to Amritsar.

Table 4.3: Frequency Distribution of the MSMEs according to size, type and location

District (Location)	Size of enterprise					
	Micro		Small		Medium	
	Type of Enterprise		Type of Enterprise		Type of Enterprise	
	Manufacturing	Services	Manufacturing	Services	Manufacturing	Services
	Count	Count	Count	Count	Count	Count
Jalandhar	19	29	14	16	6	8
Amritsar	16	19	10	15	5	8
Ludhiana	45	64	34	39	14	23

4.1.2.2 Types of Industries: The table below shows the different kinds of industries under study. It covered almost all the major industries of Punjab including industries making machine and hand tools, sports, textile, hosiery, cycle and cycle parts, agriculture, auto parts, etc. and other important services sector.

Table 4.4: Different types of industries

Types of Industries	Number in Total	Percentage in Total
Hand and machine tools	23	6.0
Hosiery and textiles	27	7.0
Electronics and IT	12	3.1
Cycle and Cycle parts	13	3.4
Sports goods	17	4.4
Agriculture and Food processing	13	3.4
Automobiles and Auto parts	23	6.0
Chemicals and Pharmaceuticals	12	3.1
Printing and Packaging	10	2.6
Building and Construction	13	3.4
Transport, Storage, Courier	28	7.3
Maintenance and Repair	37	9.6
Advertisement/Marketing/Communication	25	6.5
Financial and Insurance	16	4.2
Tour and Travel	26	6.8
Trading firms	23	6.0
Real Estate	11	2.9
Hospitality	11	2.9
Consultants	24	6.3
Others	20	5.2
Total	384	100.0

4.1.2.3 Age of the firm: Age of the firm was categorized into five parts i.e. below one year, one to two years, two to five years, five to ten years and above ten years. Most of the industries were above the age of 10 years followed by 5-10 years and so on.

Table 4.5: Showing the age of MSMEs of Punjab

Age Categories	Frequency	Percent
Below 1 year	3	.8
1-2 years	12	3.1
2-5 Years	62	16.1
5-10 Years	145	37.8
Above 10 Years	162	42.2
Total	384	100.0

4.1.2.4 Percentage of business through internet: The following table shows that around 45% claim that they were not doing business using online methods, whereas there were just around 4% of the total respondents who were earning more than 50% business through internet.

Table 4.6: Showing the percentage of business through the use of internet

	Frequency	Percent
Zero% (Non-Adopters)	171	44.5
Below 10%	113	29.4
10-30%	65	16.9
30-50%	19	4.9
Above 50%	16	4.2
Total	**384**	**100**

In order to understand the above table in a better way that what stagers were earning which level of business through internet a cross tabulation was performed and the following results were generated which shows that most of the e-mail stagers were earning below 10% business, 10-30% business was mostly earned by Interactive stagers, above 30% business was earned by Transactive stagers. So the result

showed that there was rise in the percentage of business through internet with increase in the level of e-Commerce adoption.

Table 4.7: Cross-tabulation of percentage of business from internet * e-commerce adoption

Percentage of Business through internet	Non-Adopters	E-mail stage	Static stage	Interactive stage	Transactive stage	Total
Zero% (Non-Adopters)	136	17	14	4	0	171
Below 10%	0	43	28	29	13	113
10-30%	0	8	11	32	14	65
30-50%	0	1	3	5	10	19
Above 50%	0	2	1	3	10	16
Total	136	71	57	73	47	384

4.1.2.5 Investments: Investments in MSMEs were divided into three categories i.e. below one crore, one to ten crore and above 10 crore for different sizes of organizations (Micro, Small and Medium). The following pie chart shows that 50% of MSMEs have investments in the range of below 1 crore, 33% have 1-10 crore and the remaining 16% have 10-50 crore value invested in these organizations
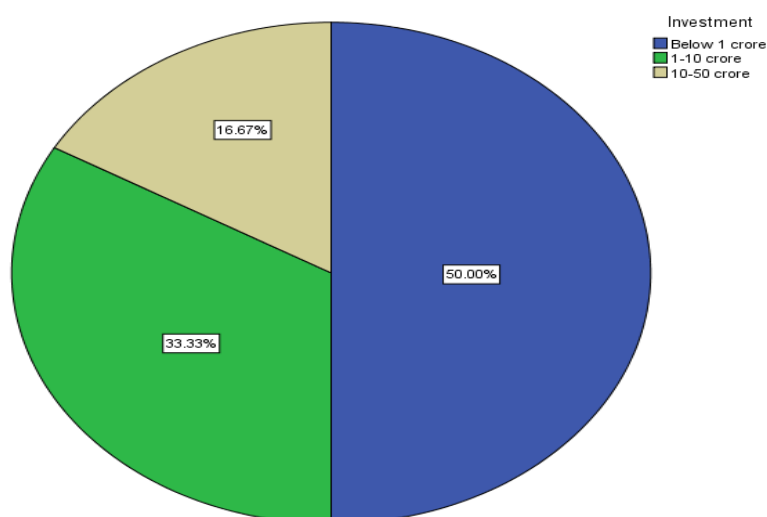
Figure 4.2: Investments in MSMEs

4.1.2.6 Turnover: Turnover in these enterprises was also categorized in three parts i.e. below 5 crores, 5-50 crores and 50-250 crores. The following bar chart shows that 192 enterprises were having turnover below 5 crores, 128 were having turnover between 5-50 crores and 64 were having it between 50-250 crores.
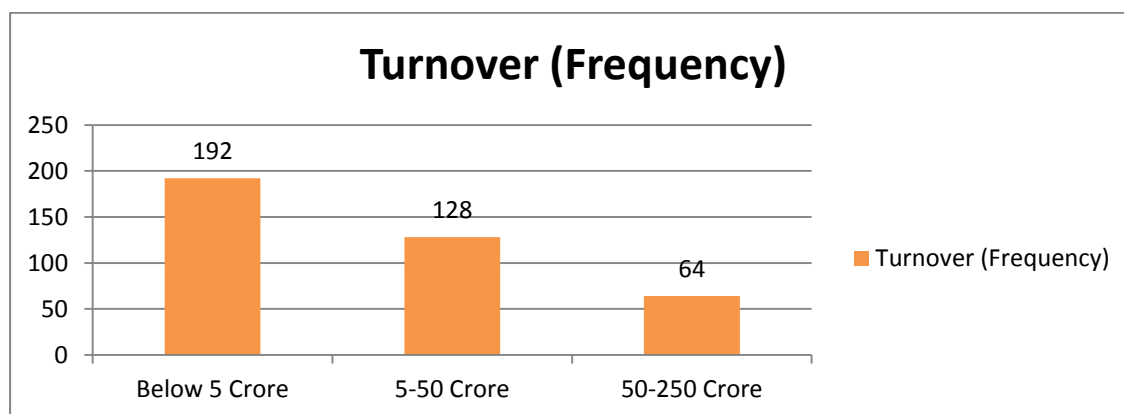
Figure 4.3: Turnover of MSMEs

4.1.2.7 Length of e-commerce adoption: The table below reveals that 37.2% enterprises did not use internet for business, 4.2% have started using it less than a year back, 17.4% were using it for less than 2 years back, 24% have been using it for 2-5 years and 17.2% of MSMEs have adopted it for more than 5 years.

Table 4.8: Time period of adoption of e-commerce

	Frequency	**Percent**
Not used for business	136	35.4
Below 1 year	16	4.2
1-2 years	67	17.4
2-5 years	99	25.8
Above 5 years	66	17.2

4.2   DEGREE OF ASSOCIATION OF DEMOGRAPHIC CHARACTERISTICS WITH E-COMMERCE ADOPTION

Various characteristics of respondents like gender, age, qualification, etc. and organizational characteristics like age of firm, size of enterprise, type of enterprise

were compared with e-commerce adoption through the use of Chi-Square technique to understand their degree of association and the following results were obtained:

Table 4.9: Chi-Square results of degree of association of demographic variables with e-commerce adoption

Characteristics of Respondents and Organizations	Pearson Chi-Square Value	df	Asymp. Sig	Result
Gender of respondent	3.051	4	.549	Not Significant
Age of respondent	7.219	12	.843	Not Significant
Qualification of respondent	26.747	20	.143	Not Significant
Size of firm (Micro, Small or Medium)	31.535	8	.000	**Significant**
Type of firm (Manf. or Services)	1.169	4	.883	Not Significant
Location of firm (District wise)	12.909	8	.115	Not Significant
Percentage of business through internet	359.931	16	.000	**Significant**
Age of firm	27.778	16	.034	**Significant**
Length of e-commerce adoption	405.975	16	.000	**Significant**

The above table shows that size of firm, age of the firm, percentage of business through internet and length of use of e-commerce adoption are significantly related to the e-commerce adoption. It implies that higher these variables, the higher will be the stage of adoption of e-commerce. Other factors like type of firm and its location, characteristics of respondents have no significant relation with the e-commerce adoption.

4.3   EXTENT OF E-COMMERCE ADOPTION

The extent of e-commerce adoption in the MSMEs of Punjab has been studied through various angles like type of business functions performed electronically; stages of e-commerce; extent of e-commerce stages on the basis of type and size of enterprise.

4.3.1 Business functions performed electronically:

The business functions which are performed electronically by these MSMEs are shown in the following table which shows that sending and receiving business mails was the most popularly used function which was performed by 57.8% of the respondents followed by having websites for the advertisement of products and services which stood at 44.3%. Online Product and market research was more common as compared to online research on consumer preferences and online research on suppliers which stood at 39.8%, 33.1% and 27.6% respectively. Third party websites were used by just 12.2% of the respondents. Regarding financial transactions, use of EFTs was more popular than the use of smart and credit cards with 35.7% and 13.5% respondents respectively. Advanced level functions like SCM and CRM were not used at present by any respondent. It was seen that as the level of advancement of functions grows, the percentage of MSMEs performing those functions was falling. Regarding the future plan to use these functions, less than 10% of the respondents show the positive interest.

Table 4.10: Showing the type of business functions performed electronically

Business Functions performed electronically	Using	Not Using	Future Plan to use	% using	% not using	% future plan to use
Online Research on consumers' preferences	127	235	22	33.1	61.2	5.7
Online Research on suppliers	106	257	21	27.6	66.9	5.5
Online Product and Market Research	153	200	31	39.8	52.1	8.1
Sending and Receiving Business e-mails	222	143	19	57.8	37.2	4.9
Advertising products and services on company's Website	170	189	25	44.3	49.2	6.5
Using Third Party Websites for promoting your business	47	303	34	12.2	78.9	8.9

Business Functions performed electronically	Using	Not Using	Future Plan to use	% using	% not using	% future plan to use
Online Frequently Asked Questions	121	249	14	31.5	64.8	3.6
Receiving customer feedback online	121	248	15	31.5	64.6	3.9
Receiving orders from customers online	47	325	12	12.2	84.6	3.1
Selling products and services online	47	327	10	12.2	84.8	2.9
Tracking Incoming and Outgoing goods online	47	328	9	12.2	84.9	2.8
Use of credit or smart cards for business	52	311	21	13.5	81	5.5
Electronic Funds Transfer (EFT) for business	137	232	15	35.7	60.4	3.9
Customer Relationship Management	-	348	36	-	90.6	9.4
Supply Chain Management	-	348	36	-	90.6	9.4

4.3.1.1 Extent of business functions performed electronically on the basis of size of enterprise: It was observed that the most common function in medium enterprises was advertisement of the goods and services on the websites as 71.8% of the respondents from medium enterprises were having their websites. Sending and receiving business e-mails was the most popular business function performed at micro and small level enterprises having 53.6% and 58.5% respondents respectively in its favor. Around 52% of medium enterprises were performing the function of online queries and getting feedbacks, whereas this percentage was very low for micro and small enterprises which stood at 25% and 31% respectively. It was also seen that medium enterprises were more active in using the e-commerce applications in comparison to micro and small enterprises as the percentage of respondents was high for all the functions in medium enterprises when comparison was made with micro and small enterprises.

Table 4.11: Table showing types of electronic business functions on the basis of size of enterprise

Business functions performed electronically	Size of enterprise					
	Micro		Small		Medium	
	%	Total	%	Total	%	Total
Research on consumers' preferences	27.6	53	30.4	39	54.6	35
Research on suppliers	20.8	40	27.3	35	48.4	31
Product and Market Research	31.7	61	42.9	55	57.8	37
Sending and receiving business emails	53.6	103	58.5	75	68.5	44
Advertising products and services on company's Website	35.9	69	42.9	55	71.8	46
Using Third party Websites	9.8	19	13.2	17	17.2	11
Online Frequently Asked Questions (FAQ)	25.0	48	31.2	40	51.5	33
Receiving Customer feedback online	25.0	48	31.2	40	51.5	33
Receiving orders from customers online	9.8	19	13.2	17	17.2	11
Selling products and services online	9.9	19	13.2	17	17.2	11
Tracking incoming and outgoing goods	9.8	19	13.2	17	17.2	11
Using credit cards and smart cards	10.4	20	17.2	22	15.6	10
Electronic funds transfer	30.7	59	39.8	51	42.1	27
Customer relationship management	0	0	0	0	0	0
Supply chain management	0	0	0	0	0	0

4.3.1.2 Extent of business functions performed electronically on the basis of type of enterprise: On the basis of type of enterprise it was seen that online marketing functions like research on consumer preferences, suppliers, product and

market research were slightly more in services enterprises as compared to manufacturing enterprises. 61.3% of the respondents of manufacturing enterprises were sending and receiving business emails as compared to 55.2% in services enterprises. Own websites and third party websites use was slightly more in manufacturing enterprises. Regarding EFT, 43.5% of the respondents from manufacturing enterprises were using this function as compared to 29.8% of the respondents from services enterprises. So, it shows that online marketing was common in services enterprises whereas use of websites, static, interactive or third party websites was more in manufacturing enterprises.

Table 4.12: Showing electronic business functions on the basis of type of enterprise

| Business Functions Performed Electronically | Type of Enterprise | | | |
| | Manufacturing | | Services | |
	%	Total	%	Total
Research on consumers' preferences	30.6	50	34.8	77
Research on new suppliers	26.3	43	28.5	63
Product and Market Research	35.5	58	42.9	95
Sending and receiving business emails	61.3	100	55.2	122
Advertising products and services on company's Website	46.0	75	42.9	95
Using Third party Websites	12.8	21	11.7	26
Online Frequently Asked Questions (FAQ)	33.7	55	29.8	66
Receiving Customer feedback online	33.7	55	29.8	66
Receiving orders from customers online	12.8	21	11.7	26
Selling products and services online	12.8	21	11.7	26
Tracking incoming and outgoing goods	12.8	21	11.7	26
Using credit cards and smart cards	17.1	28	10.8	24
Electronic funds transfer	43.5	71	29.8	66
Customer relationship management	0	0	0	0
Supply chain management	0	0	0	0

Table 4.13: Detail of business functions performed electronically in various types of enterprises (%)

Type / Elec. Functions	R. Consumer Pref.	R. on Suppliers	Product & Mkt. R	Business e-mails	Adv. Co. web	Third Party Website	FAQ	Receiving Feedback	Receiving Orders	Selling Online	Tracking of Goods	Credit & Smart Cards	EFT	Total
Hand and Machine tools	34.7	30.4	34.7	56.5	47.8	13.0	47.8	47.8	13.0	13.0	13.0	34.7	47.8	23
Hosiery & Textiles	18.5	14.8	29.6	51.8	40.7	22.2	22.2	22.2	22.2	22.2	22.2	14.8	37.0	27
Electronic & IT	50.0	33.3	50.0	58.3	33.3	-	33.3	33.3	-	-	-	25.0	33.3	12
Cycle & Cycle Parts	15.3	15.3	23.0	53.8	46.1	15.3	30.7	30.7	15.3	15.3	15.3	15.3	38.4	13
Sports Goods	41.1	29.4	52.9	64.7	70.5	17.6	41.1	41.1	17.6	17.6	17.6	17.6	17.6	17
Agriculture & Food Processing	46.1	46.1	46.1	61.5	53.8	15.3	46.1	46.1	15.3	15.3	15.3	7.6	76.9	13
Automobiles and Auto parts	26.0	21.7	34.7	60.8	34.7	8.6	26.0	26.0	8.6	8.6	8.6	13.0	47.8	23
Chemicals and Pharmaceuticals	16.6	16.6	16.6	41.6	25.0	-	16.6	16.0	-	-	-	8.3	33.3	12
Printing and Packaging	40.0	40.0	40.0	80.0	60.0	20.0	50.0	50.0	20.0	20.0	20.0	20.0	50.0	10
Building & Construction	30.7	30.7	38.4	76.9	46.1	15.3	46.1	46.1	15.3	15.3	15.3	7.6	53.8	13

Type / Elec. Functions	R. Consumer Pref.	R. on Suppliers	Product & Mkt. R	Business e-mails	Adv. Co. web	Third Party Website	FAQ	Receiving Feedback	Receiving Orders	Selling Online	Tracking of Goods	Credit & Smart Cards	EFT	Total
Transport, Storage & Courier	42.8	32.1	58.6	67.8	57.1	7.14	39.2	39.2	7.14	7.14	7.14	14.2	32.1	28
Maintenance & Repair	27.0	24.3	32.4	40.5	27.0	13.5	24.3	24.3	13.5	13.5	13.5	13.5	29.7	37
Adv. / Mkt / Communication	28.0	28.0	36.0	48.0	36.0	20.0	28.0	28.0	20.0	20.0	20.0	16.0	28.0	25
Finance and Insurance	25.0	18.7	37.5	68.7	43.7	-	25.0	25.0	-	-	-	-	18.7	16
Tour and Travel	46.1	26.9	46.1	57.6	46.1	11.5	26.9	26.9	11.5	11.5	11.5	15.3	26.9	26
Trading Firms	30.4	26.0	39.1	60.8	43.4	8.69	30.4	30.4	8.69	8.69	8.69	4.34	39.1	23
Real Estate	54.5	45.4	72.2	72.2	54.5	18.1	36.3	36.3	18.1	18.1	18.1	18.1	36.3	11
Hospitality	27.2	27.2	27.2	27.2	45.4	-	27.2	27.2	-	-	-	-	27.2	11
Consultants	45.8	41.6	54.1	70.8	58.3	12.5	29.1	29.1	12.5	12.5	12.5	8.33	33.3	24
Others	25.0	20.0	25.0	55.0	35.0	15.0	25.0	25.0	15.0	15.0	15.0	10.0	30.0	20

The table no. 4.13 shows the detail of various business functions performed electronically on the basis of various types of enterprises. It shows the percentages of enterprises performing the following mentioned business functions. It is found that research on consumer preferences and market research is most common in real estate business which stands at 54.5 % and 72.2% resp. Research on suppliers is mostly done in agricultural and food processing enterprises with 46.1% doing the same. Sending and receiving of business e-mails is common in Printing and Packaging. 70.5% of the Sport goods manufacturing enterprises use own websites, 22.2% of Textiles and Hosiery enterprises use third party websites and make online sales, which is the highest as compared to others. Smart cards use is more popular with Hand and Machine tools manufacturing enterprises which stand at 34.7% whereas EFT is used by 77% of Agricultural and Food processing enterprises.

4.3.2 Stages of e-commerce adoption

The following table below presents the detail of the e-commerce adoption stages in MSMEs of Punjab. It shows that 35.4% of the enterprises were non-adopters. They didn't use internet for business and follow only traditional methods of trading. Around 18.5% were using e-mails, 14.8% were at static stage, 19% MSMEs at interactive stage and finally 12.2% at Transactive Stage and no one was at integrated stage.

Table 4.14: Showing stages of e-commerce adoption

	Frequency	Percent
Non Adopters	136	35.4
E-mail stage	71	18.5
Static stage	57	14.8
Interactive stage	73	19.0
Transactive Stage	47	12.2
Total	**384**	**100.0**

4.3.2.1.   Extent of adoption of e-commerce on the basis of size of enterprise: It is clear from the table below that around 42% of the micro enterprises were non

adopters and the percentage of non-adopters decreases as the size of the enterprise increases as it stands at 32% for small and 20% for medium enterprises. E-mail stage was common with small enterprises with 13% of small enterprises as compared to 19.8% micro and 4.6% medium enterprises. Moreover, it was also seen that percentages of MSMEs at Static, Interactive and Transactive stages were more in medium sized enterprises as compared to others with 25% at Static, 32% at Interactive stage and 17% at Transactive stage.

Table 4.15: Showing the Extent of adoption of e-commerce on the basis of size of enterprise

Stage/Size	Micro		Small		Medium	
Non-Adopters	82	42.7	41	32.0	13	20.3
E-mail stage	38	19.8	30	23.4	3	4.6
Static stage	24	12.5	17	13.2	16	25
Interactive stage	29	15.1	23	17.9	21	32.8
Transactive stage	19	9.8	17	13.4	11	17.2
Total	**192**	**100**	**128**	**100**	**64**	**100**

4.3.2.2 Extent of adoption of e-commerce on the basis of type of enterprise: On the basis of type of enterprises, there are basically two categories i.e. Manufacturing and Services enterprises. The stages of e-commerce adoption were observed in both these type of enterprises. It can be seen from the following table that there are not huge differences between manufacturing and services enterprises on the basis of extent of adoption of e-commerce. However, non-adopters were slightly more in case of service enterprises when compared to manufacturing enterprises. Services units were having 37.1% non-adopters as compared to 33.1% in manufacturing enterprises. E-mail and Static stagers were almost same in both. The enterprises at Interactive and Transactive Stages was more in manufacturing enterprises with 20.8% and 12.8% respondents as compared to 17.6% and 11.7% of services enterprises at these stages respectively.

Table 4.16: Showing the stage of adoption of e-commerce on the basis of type of enterprise

E-commerce adoption stage / Type of Enterprise	Manufacturing Enterprises		Services Enterprises	
Non Adopters	54	33.1%	82	37.1%
E-mail stage	31	19.0%	40	18.1%
Static stage	23	14.1%	34	15.3%
Interactive Stage	34	20.8%	39	17.6%
Transactive Stage	21	12.8%	26	11.7%
Total	163	100%	221	100%

The table below shows the various types of enterprises under both manufacturing and services units with their stages of e-commerce adoption. It is observed that hospitality enterprises with 54.5% of the total have the highest number of non-adopters as compared to other types of enterprises. E-mail stage is most common in Finance and Insurance enterprises with 31.25% of the total enterprises in that group. Consultancy enterprises are more prevalent at static stage with 29.1% of the total. Interactive stagers are more in Hand and Machine making tools enterprises with 34.7% of the total and the Transactive Stage is most popular with Hosiery and Textiles manufacturing enterprises with 22.2% of the total respondents from sports goods making enterprises doing online sales. So, different types of manufacturing and services enterprises in Punjab were at different stage of adoption of e-commerce.

Table 4.17: Extent of e-commerce adoption on the basis of various types of enterprises

Type / Stages of e-commerce adoption	Non-Adopters		E-mail stage		Static Stage		Interactive Stage		Transactive Stage	
	Total	%	Total	%	Total	%	Total	%	Total	%
Hand and Machine tools	9	39.1	2	8.6	1	4.3	8	34.7	3	13
Hosiery &Textiles	13	50	3	11.5	5	19.2	0	-	6	22.2
Electronic & IT	4	33.3	3	25	1	8.3	4	33.3	0	-
Cycle &Cycle Parts	5	38.4	2	15.3	2	15.3	2	15.3	2	15.3
Sports Goods	3	16.6	2	11.1	5	27.7	4	22.2	3	17.6
Agriculture & Food Processing	5	38.4	1	7.6	1	7.6	4	30.7	2	15.3
Automobiles and Auto parts	7	30.4	7	30.4	3	13.0	4	15.3	2	7.69
Chemicals and Pharmaceuticals	7	5.8	2	16.6	1	8.3	2	16.6	0	-
Printing and Packaging	2	20	2	20	1	10	3	30	2	20
Building & Construction	3	23	3	23	1	7.6	4	30.7	2	15.3
Transport, Storage & Courier	5	17.8	7	25	5	17.8	9	32.1	2	7.1
Maintenance & Repair	16	43.2	9	24.3	3	8.1	4	10.8	5	13.5
Adv./Mkt/Communication	12	48	4	16	2	8	2	8	5	20
Finance and Insurance	5	31.2	5	31.2	2	12.5	4	25	0	-
Tour and Travel	8	30.7	5	19.2	6	23	4	15.3	3	11.5
Trading Firms	8	34.7	5	21.7	3	13	5	21.7	2	8.6
Real Estate	3	27.2	1	9.1	3	27.2	2	18.1	2	18.1
Hospitality	6	54.5	0	-	2	18.1	3	27.2	0	-
Consultants	7	29.1	4	16.6	7	29.1	3	12.5	3	12.5
Others	8	40	4	20	3	15	2	10	3	15

From the findings of this chapter it can be concluded the MSMEs of Punjab were doing just the basic functions electronically. Advanced electronic functions of CRM, SCM, etc. were not used. This finding is consistent with the study done in Tanzania,

where Ndayli in 2013 observed that small enterprises in Tanzania were using the base applications only, like e-mail and internet was used for the purpose of the advertisement of goods and services only and not to conduct transactions.

For the e-commerce adoption stages the output shows that around 35% of the enterprises were non-adopters and were using only traditional methods of trading. Around 18% were at e-mail stage, 14% at static stage, followed by 19% MSMEs at interactive stage and finally 12% at transactive Stage and no enterprise was at integrated stage. This finding is supported by a study in Ghana by Ochoo et al in 2018 where he found enterprises at lower stages of adoption in Ghana. Six staged model was used by him in his research from non-adopters to e-collaborate stage and found that enterprises were active till the level of e-interact only i.e. till the fourth stage. Moreover Rahayu and Day in 2017 found Indonesian MSMEs under study did not go beyond the fifth stage out of total six stages of e-commerce adoption.

CHAPTER – 5

DETERMINANTS OF E-COMMERCE ADOPTION IN MSMEs OF PUNJAB

INTRODUCTION

The chapter not only focuses on the determinants of adoption of e-commerce but also to understand the influencing factors between various stages of e-commerce adoption. Moreover a comparison was made between the manufacturing and services enterprises to find any differences in the adoption factors between them and finally various barriers and facilitators of e-commerce adoption were identified. This chapter has been organized as follows:

5.1   Preliminary Analysis.

5.2   Identification of the factors influencing the e-commerce adoption in Punjab MSMEs.

5.3   Examining the influencing factors between various stages of adoption of e-commerce.

5.4   Comparative analysis of e-commerce adoption factors between manufacturing and service enterprises of Punjab.

5.5   Identification of the barriers and facilitators of e-commerce adoption in MSMEs of Punjab.

5.1   PRELIMINARY ANALYSIS

Before testing the hypothesis, it was necessary to conduct some preliminary analysis to make sure that the data is fit for the test. First, data screening was done to ensure that there was no missing item. The data was also scanned to ensure that there were no outliers. For this purpose, box-plots were used. Further, it was also required to find if all the factors that were proposed in the research model were truly measuring the underlying constructs, it was necessary to apply factor analysis. Factor analysis has two major classifications, one is exploratory and other is confirmatory. When the purpose is to explore the factors from multiple items using some analysis, then

exploratory factor analysis is used, i.e. the researcher does not know the number of factors before analysis. However, when the factors have been derived from the literature and the researcher knows the number of factors that are to be studied representing a set of variables before the statistical analysis is done, then confirmatory factor analysis is used to confirm how well the variables have loaded to their respective factors (Hair et al., 2010). So, CFA was applied to understand how better the factors derived from the theory perform in terms of the loadings of variables on their respective constructs. Before applying CFA, it was ensured that there is normal distribution of the data. The Skewness and Kurtosis values for the factors were in the range ± 1.96 (Hair et al., 2010). CFA results showed that all the standardized loading estimates were above 0.5 except one item 'NATREAD 1 = Government is providing adequate support for improving EC adoption' which was having loading of 0.44 so it was deleted and the remaining loadings were as under:

Table 5.1: Standardized Loadings

	Items	S. Loadings
RAdv1	EC increases profitability	0.925
RAdv2	EC improves the market share for products and services	0.887
RAdv3	EC provides better access to information	0.685
RAdv4	EC improves job performance	0.849
RAdv5	EC provides new business opportunities	0.853
RAdv6	EC is cost efficient	0.893
RAdv7	EC saves time and efforts	0.916
Compb1	EC fits with our type of business	0.793
Compb2	EC fits with our present IT infrastructure	0.825
Compb3	EC fits with the values of our business	0.786
Compb4	EC fits with the culture of our organization	0.771
Compb5	EC is compatible with our work practices	0.754
Complx1	Use of EC is not easy for our employees	0.869
Complx2	It takes a long time to learn using EC	0.856
Complx3	Use of EC is not easy for parties (suppliers and customers) related to the organization	0.817

	Items	S. Loadings
Complx4	EC requires high skills	0.731
Tri1	Trialability option helps in deciding to adopt EC	0.870
Tri2	Trialability options improves the confidence to adopt EC	0.826
Tri3	Nothing much will be lost in trying EC, even if found not useful	0.766
Obs1	Observing others using EC actively will help in its adoption	0.874
Obs2	Observing others benefitting from EC use will help in its adoption	0.822
Obs3	The more the benefits of EC can be communicated to others the more will be its adoption.	0.805
Cost1	Cost of ICT for EC is not affordable	0.774
Cost2	Cost of EC installation is high	0.793
Cost3	Cost of Training is expensive	0.825
Cost4	Cost of maintenance and updating the system is not affordable	0.780
Cost5	Cost of investment in e-commerce is above the expected return on investment	0.722
Sec1	EC lacks backing of strong cyber laws	0.789
Sec2	Lack of sufficient security for online payment and transaction	0.702
Sec3	Our firm don't want to take risk of hacking of data	0.711
Sec4	We are afraid of viruses in the use of EC	0.700
Sec5	EC is considered unreliable by the parties.	0.818
Own1	Owner's awareness of EC benefits helps in its adoption	0.798
Own2	Owner's level of education effects the adoption of EC	0.720
Own3	Owner's innovativeness promotes use of EC	0.719
Own4	Owner's gender effects the adoption of EC	0.629
Own5	Owner's age effects the adoption of EC	0.660
Own6	Owner's risk taking behavior influences the adoption of EC	0.771
Org1	Our firm has the required size to adopt EC	0.628

		Items	S. Loadings
Org2	Our organization have the required IT resources		0.747
Org3	Our organization have the required financial resources		0.726
Org4	Our organization have required skilled human resources		0.806
Org5	The employees of the organization are receptive to new technology		0.906
Mf1	Majority of our Trading Partners have already adopted EC		0.690
Mf2	Our suppliers and business partners pressurizes us to adopt EC		0.704
Mf3	Changing customer preferences and lifestyle prompts us to adopt EC		0.861
Mf4	Culture of trading with EC is prevalent in market		0.876
Tv1	Experienced technology vendors for developing EC applications are available		0.964
Tv2	We get sufficient support of technology vendors for EC adoption		0.579
Tv3	Technology vendors provide us quick solutions of problems when needed.		0.549
Tv4	Timely technical advice given by vendors intensifies the EC adoption		0.641
Tv5	Technology vendors provide relevant information to us		0.797
Compre1	Intensity of competition is compelling us to adopt EC		0.828
Compre2	Enterprises adopting EC become more competitive		0.823
Compre3	Use of EC by our competitors influence us to adopt it		0.827
Compre4	Benefits derived by our competitors from EC prompt us to adopt it		0.783
Compre5	Pressure from dominant players improves EC adoption		0.833
Natread2	Telecommunication infrastructure is adequate		0.685
Natread3	Power Supply is smooth and sufficient to adopt EC		0.660
Natread4	e-financial system is good and reliable		0.825
Natread5	Transport and Delivery support for EC is satisfactory		0.863
Natread6	Number of Internet service providers is sufficient		0.798

As all the loadings as shown above were above the recommended level of 0.5, so, all the factors were retained. The factors and the variables in the final research model were tested for reliability and validity. For ensuring construct validity; composite reliability, convergent validity, discriminant validity were observed. Composite reliability was calculated to find out the internal consistency in scale items and it should be above 0.7. Convergent validity shows that the items under the same construct highly correlated with each other. It was calculated with Average Variance Extracted (AVE) and the recommended range is above 0.5 (Hair et al., 2010). The discriminant validity depicts that the items under a particular factor correlate heavily with that particular construct rather than other factors. It requires that the correlation between the factors should be less than the value obtained by the square root of AVE. Reliability test was diagnosed with Cronbach's alpha and composite reliability. The recommended statistics for both are above 0.7 (Hair et al., 2010).

Table 5.2: Cronbach's alpha, C.R. and Average Variance Extracted (AVE)

Variables	Cronbach's alpha (α)	Average Variance Extracted (AVE)	Composite Reliability
Relative Advantage	.951	.742	.952
Compatibility	.890	.618	.889
Complexity	.890	.672	.891
Trialability	.859	.675	.861
Observability	.872	.696	.872
Cost	.885	.608	.885
Security	.857	.556	.861
Owner's Characteristics	.861	.516	.864
Organizational e-readiness	.869	.590	.876
Market Force Influence	.869	.620	.865
Technology Vendors support	.784	.522	.839
Competitive Pressure	.910	.671	.910
National e-readiness	.875	.593	.878

The above table shows that Cronbach's alpha, Composite reliability and AVE, all were as per their range recommended i.e. Cronbach'a alpha and C.R. were more than 0.7 and AVE was more than 0.5. So, the variables had good internal consistency and also had convergent validity. For discriminant validity, square roots of AVE were compared to the inter-construct correlations. In the following diagram, the diagonal line with bold values are the square roots of AVE and the values below that diagonal are the inter-construct correlations. All the inter-construct correlations are having values below the square roots of AVE values. So discriminant validity was also achieved.

Table 5.3: Discriminant Validity

Latent Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
RAdvantage	**.86**												
Compatibily	.59	**.78**											
Complexity	-.27	-.41	**.82**										
Trilability	.35	.33	-.08	**.82**									
Observabilty	.34	.26	-.12	.65	**.83**								
Cost	-.24	-.40	.47	-.12	-.12	**.78**							
Security	-.28	-.39	.40	-.16	-.17	.46	**.74**						
OwnCharc	.36	.39	-.27	.38	.34	-.26	-.38	**.71**					
OrgE-R	.44	.53	-.32	.37	.30	-.26	-.44	.49	**.76**				
MF Infl.	.39	.45	-.18	.20	.19	-.18	-.23	.32	.45	**.78**			
TVendor S	.39	.50	-.37	.32	.31	-.32	-.36	.34	.45	.33	**.72**		
CPressure	.46	.52	-.29	.27	.25	-.22	-.34	.42	.57	.49	.45	**.82**	
NatE-Rd	.34	.38	-.28	.23	.22	-.17	-.24	.31	.47	.22	.33	.48	**.77**

All the results of preliminary analysis were satisfactory, so it was assumed that the data was fit for further analysis.

5.2 IDENTIFICATION OF THE FACTORS INFLUENCING THE ADOPTION OF E-COMMERCE IN THE MSMES OF PUNJAB

There are various factors that hinder the adoption of e-commerce in the MSME sector. In the study, thirteen factors were included that were derived from various studies done in different countries. The factors that influence the decision to adopt may differ from one country to another depending upon the level of development, availability of infrastructure, current legal provisions concerning cyber crimes, etc. For getting awareness regarding the different factors that influence the adoption of e-commerce in the context of Punjab, ordered logistic regression was applied. This technique is useful when the dependent variable is ordered and the independent is on likert scale (Adeleke and Adepoju, 2010). But before applying this tool, some assumptions were needed to be satisfied.

5.2.1 Assumptions to use Ordered Logistic Regression

There is a need to justify the assumption of multi-collinearity and odds of proportional lots before applying ordered logistic regression. In order to diagnose multi-collinearity, it should be checked that the explanatory variables are showing correlations below 0.7 among them (Yoo et al., 2014). So, in order to test the multi-collinearity issues, correlation technique was used and its results are shown in table no. 5.4.

The table no. 5.4 shows that there was no issue of multi-collinerity as all the variables were showing the correlation below 0.580. Moreover, some authors recommended that, for no sign of multi-collinearity, tolerance should be above 0.1 and (Variance Inflation Factor) VIF should be below 10 (Daoud, 2017). So, as per the table no. 5.5, the tolerance of the predictor variables was above 0.1 and VIF was below 10. Hence, it was assumed that there was no problem regarding the multi-collinerity between the independent variables.

Table 5.4: Correlations

		Rel	Comptb	Complx	Tril	Obser	Cos	Secu	Owner	Org	Mf	Tv	Compres	Nat
Relative advantage	P	1	.535**	-.243**	.315**	.303**	-.214**	-.265**	.327**	.408**	.365**	.391**	.427**	.333**
	Sig		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	384	384	384	384	384	384	384	384	384	384	384	384	384
Compatibility	P		1	-.366**	.292**	.230**	-.361**	-.357**	.344**	.493**	.400**	.459**	.474**	.368**
	Sig.			.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N		384	384	384	384	384	384	384	384	384	384	384	384
Complexity	P			1	-.068	-.093	.426**	.365**	-.241**	-.287**	-.165**	-.326**	-.256**	-.276**
	Sig				.185	.067	.000	.000	.000	.000	.001	.000	.000	.000
	N			384	384	384	384	384	384	384	384	384	384	384
Trialability	P				1	.580**	-.106*	-.147**	.324**	.340**	.174**	.287**	.239**	.202**
	Sig					.000	.038	.004	.000	.000	.001	.000	.000	.000
	N				384	384	384	384	384	384	384	384	384	384
Observability	P					1	-.112*	-.160**	.302**	.252**	.160**	.251**	.221**	.196**
	Sig.						.029	.002	.000	.000	.002	.000	.000	.000
	N						384	384	384	384	384	384	384	384

		Rel	**Comptb**	**Complx**	**Tril**	**Obser**	**Cos**	**Secu**	**Owner**	**Org**	**Mf**	**Tv**	**Compres**	**Nat**
Cost	P						1	.420**	-.228**	-.240**	-.175**	-.302**	-.198**	-.184**
	Sig							.000	.000	.000	.001	.000	.000	.000
	N						384	384	384	384	384	384	384	384
Security	P							1	-.339**	-.387**	-.225**	-.370**	-.310**	-.232**
	Sig								.000	.000	.000	.000	.000	.000
	N							384	384	384	384	384	384	384
Owner's characteristics	P								1	.435**	.284**	.333**	.374**	.272**
	Sig.									.000	.000	.000	.000	.000
	N								384	384	384	384	384	384
Organization e-readiness	P									1	.416**	.432**	.517**	.433**
	Sig.										.000	.000	.000	.000
	N									384	384	384	384	384
Market force influence	P										1	.305**	.458**	.231**
	Sig.											.000	.000	.000
	N										384	384	384	384

		Rel	Comptb	Complx	Tril	Obser	Cos	Secu	Owner	Org	Mf	Tv	Compres	Nat
Technology vendor support	P											1	.444**	.308**
	Sig.												.000	.000
	N											384	384	384
Competitive Pressure	P												1	.456**
	Sig													.000
	N												384	384
National e-readiness	P													1
	Sig.													
	N													384

Table 5.5: Showing tolerance and VIF values

Model	Collinearity Statistics	
	Tolerance	VIF
Relative advantage	.622	1.609
Compatibility	.525	1.905
Complexity	.713	1.403
Trialability	.598	1.671
Observability	.636	1.573
Cost	.708	1.412
Security	.682	1.467
Owner's characteristics	.704	1.420
Organization e-readiness	.537	1.863
Market force influence	.710	1.409
Technology vendor support	.645	1.550
Competitive Pressure	.550	1.820
National e-readiness	.709	1.410

Second assumption to use ordered logistic regression is to test for parallel lines or in other words, the assumption of proportional odds. It states that the effect of any independent variable is consistent or proportional across the different categories of dependent variable and to prove this assumption the p-value should be more than 0.05. The p-value was above 0.05 which proves that this assumption is also satisfied.

Table 5.6: Showing test of parallel lines

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Null Hypothesis	815.053	30.935[c]	39	.818
General	784.118[b]			

5.2.2 Assessing Model Fitness

To test the Model fitness, some tests like -2 log likelihood test, pseudo $R2$ and goodness of fit test are required to be performed (Hair, et al., 2010).

-2 Log Likelihood test: The table below shows the model fitting information i.e. it compares the model without any independent variables to a model with independent variables and shows if there is any improvement in the model to predict the outcome. This table gives values for the basic and the final model through -2 log likelihood and the Chi-square compares the difference in the values of -2 log likelihood for both base model and final model. In the table, p-value is significant showing sufficient improvement in the final model over the base model.

Table 5.7: Model fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	1179.322	364.269	13	.000
Final	815.053			

Goodness-of-fit: Two Chi-square values are given by the goodness of fit model, one is Pearson and other is Deviance. These values indicate whether the observed data is consistent with the fitted model. If the p-value is more than 0.05, then it shows that the model fits in the data very well. The table below shows p-value was not significant so the model is good.

Table 5.8: Goodness-of-fit

	Chi-Square	Df	Sig.
Pearson	1513.726	1511	.475
Deviance	815.053	1511	1.000

Pseudo R-Square: Pseudo R-Square shows the proportion of variance in the outcome explained by the independent variables. The larger the value, the better it is. The following table shows the Nagelkerke value of 0.643 which means 64.3% of the variance in the outcome was being explained by the explanatory variables. So the three tests justified the fitness of the model.

Table 5.9: Pseudo R-Square

Cox and Snell	.613
Negelkerke	.643
McFadden	.309

5.2.3 Parameter Estimates

Ordered Logistic regression was run taking Transactive stage as the reference category. The result of analysis shows that some determinants of e-commerce adoption were found significant whereas others were insignificant based on the p-value. The table no. 5.10 shows that Relative advantage, Complexity, Security, Market Force Influence, Organization e-readiness, Compatibility and Technological Vendors support are the significant factors that influence the decisions of the owners/managers/CEOs of the MSMEs to adopt e-commerce in their organizations.

Positively supported determinants: Relative advantage, Market Force Influence, Organization e-readiness, Compatibility and Technological Vendors support are the positively supported determinants showing that the higher the values of these variables, the greater will be the e-commerce adoption. The positive beta coefficients show positive correlation of predictors with outcome variable and vice-versa for negative coefficient. The positive 0.301 on Relative Advantage shows that keeping all the remaining variables constant, with increase in relative advantage, there will be rise in the log odds of being present in an advanced level of e-commerce adoption. So Relative Advantage of technology promotes and boosts the e-commerce adoption. The positive coefficient compatibility depicts that when all the remaining variables are kept constant, with increase in compatibility there will be rise in the log odds of being in the upper level of e-commerce adoption. Organization's e-readiness in terms of financial, skilled human, IT resources etc. also help in its adoption. Similarly, Market Force Influence and Technology Vendors support are the other positive significant factors of adoption of e-commerce. These positively significant factors indicate that with their increase, the log odds of being in the higher levels of e-commerce adoption will also rise.

Table 5.10: Showing parameter estimates

		Est.	S. E.	Wald	Df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[StageDetail = 0]	3.552	.892	15.846	1	.000	1.803	5.301
	[StageDetail = 1]	5.052	.914	30.549	1	.000	3.260	6.843
	[StageDetail = 2]	6.521	.946	47.510	1	.000	4.667	8.375
	[StageDetail = 3]	8.763	.998	77.134	1	.000	6.807	10.718
Location	Relative advantage	.301	.109	7.564	1	.006	.087	.516
	Compatibility	.552	.126	19.110	1	.000	.304	.799
	Complexity	-.510	.116	19.444	1	.000	-.736	-.283
	Trialability	.145	.126	1.328	1	.249	-.102	.393
	Observability	.183	.118	2.409	1	.121	-.048	.413
	Cost	-.107	.120	.798	1	.372	-.343	.128
	Security	-.445	.106	17.651	1	.000	-.652	-.237
	Owner's characteristics	-.055	.108	.256	1	.613	-.267	.157
	Organization e-readiness	.417	.129	10.477	1	.001	.164	.669
	Market force influence	.284	.114	6.204	1	.013	.060	.507
	Technology vendor support	.573	.172	11.090	1	.001	.236	.911
	Competitive Pressure	.203	.131	2.389	1	.122	-.054	.460
	National e-readiness	.045	.130	.120	1	.729	-.209	.299
Link function: Logit.								

Negatively Supported determinants: Complexity and Security are negatively supported determinants showing that more the complexity and security concerns, the lower will be the e-commerce adoption. The negative -0.510 on complexity means that keeping all the remaining variables constant, the log odds of being in the upper e-commerce adoption stages will decrease with increase in complexity. As complexity and security are having negative beta coefficients, so it can be accepted that these three factors create obstacles for MSMEs to adopt e-commerce.

5.3 THE INFLUENCING FACTORS BETWEEN VARIOUS STAGES OF E-COMMERCE ADOPTION

The third objective was to examine the influencing factors between various e-commerce adoption stages. Some authors viewed e-commerce adoption being a sequential process. An organization generally evolves through it, following a particular sequence (Levy and Powell, 2003). The following figure shows the growth in e-commerce adoption in MSMEs sector following a sequential path.
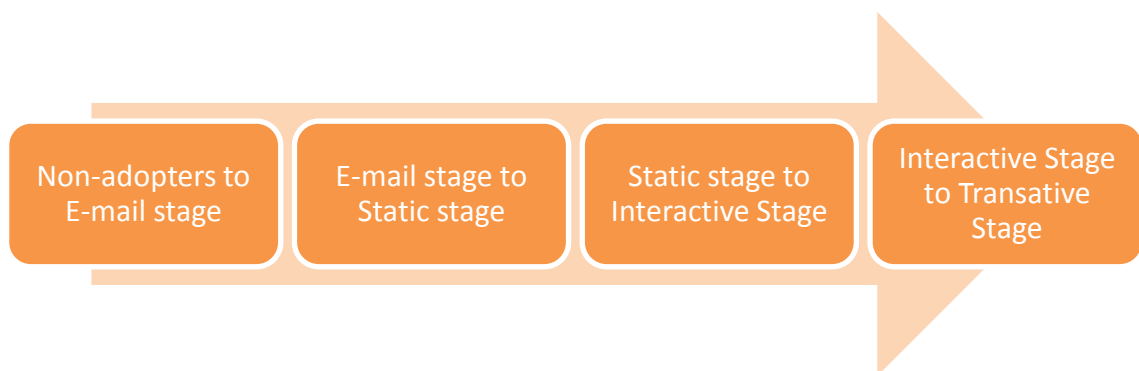
Figure 5.1: Sequential growth of MSMEs in e-commerce adoption

For understanding the significant factors between various sequential stages of acceptance of e-commerce, multiple logistic regression was applied. Following table shows the various e-commerce adoption factors for sequential stages, i.e. from Non-Adopters to E-mail, E-mail to Static, Static to Interactive and Interactive to Transactive stage.

Table 5.11: Showing level of significance between sequential stages of adoption of e-commerce

Variables/ e-commerce adoptionstages	Non-Adopter Vs. E-mail stage		E-mail stage vs. Static stage		Static vs. Interactive Stage		Interactive Vs. Transactive Stage	
	β	p-value	β	p-value	β	p-value	β	p-value
Relative Advantage	.113	0.462	.094	0.634	.209	0.354	**1.010**	**0.024**
Compatibility	.359	0.088	.362	0.105	.006	0.978	**1.281**	**0.005**
Complexity	**-.390**	**0.014**	-.014	0.947	-.266	0.294	-.509	0.145
Trialability	.243	0.211	-.449	0.074	.362	0.134	.090	0.761
Observability	-.031	0.863	**.647**	**0.008**	-.304	0.223	.089	0.709
Cost	.193	0.245	-.233	0.300	-.241	0.369	.136	0.696
Security	**-.434**	**0.005**	-.228	0.245	-.048	0.823	-.137	0.642
Owner's Characteristics	-.168	0.280	.064	0.749	.198	0.386	.041	0.889
Organization e-readiness	.284	0.262	.253	0.339	.235	0.272	.193	0.410
Market Force Influence	-.192	0.330	**.457**	**0.050**	.170	0.426	.209	0.335
Technology Vendor Support	.366	0.164	**.900**	**0.008**	-.205	0.556	-.317	0.415
Competitive Pressure	.275	0.202	-.398	0.126	**.474**	**0.050**	.204	0.457
National e-readiness	-.217	0.225	.185	0.431	.395	0.174	-.534	0.231

The above table shows the significant influencing factors between the sequential stages of adoption of e-commerce. In all the above comparisons between every two stages in sequential manner, it was observed that different factors influence at different stages of assimilation of technology. So MSMEs at different stages of assimilation perceive factors differently. The significant factors for sequential stages are Complexity, Security, Observability, Market Force Influence, Technology

Vendor Support, Competitive Pressure, Relative Advantage and Compatibility. The Non-significant factors are Trialability, Cost, Owner's Characteristics, Organization e-readiness and National e-readiness. These factors do not have an effect on the decision to accept e-commerce and thus will not be discussed here.

Direction of Association: The sign of beta coefficient indicates the direction of correlation between the factors and e-commerce adoption. The positive sign indicates that with each unit increase in predictor variable, there are positive odds of being in the higher stages of e-commerce adoption. Similarly, negative beta coefficient states that with increase in predictor variable, there are negative odds of being present in advanced levels of technology acceptance (Hair et al., 2010). Complexity and Security have negative Beta coefficients, whereas others have positive beta coefficients.

First, a comparison of non-adopters with e-mail stage was done and it was found that except complexity and security concerns, no significant difference was there. The beta coefficients of complexity and security were negative which states with increase in complexity and security there was decrease in the odds of being in the higher stage. Secondly, MSMEs at static stage were more positive for Observability, Market force influence and Technology vendors support as compared to e-mail stage. The beta coefficients are positive which show that with every rise in Observability, Market Force Influence and Technology Vendors support there is increase in the odds of being in the static stage of adoption of e-commerce. Thirdly, MSMEs at interactive stage were feeling more competitive pressure to adopt technology as compared to static stage. With increase in competitive pressure, there is increase in the odds of being in interactive stage. Lastly, the enterprises at transactive stage were feeling more relative advantage and compatibility of the technology as compared to the interactive stage. Their beta coefficients indicate that with increase in relative advantage and compatibility there is increase in the odds of being in transactive stage.

The following figure shows four models derived for sequential stages of adoption of e-commerce in Punjab's MSME sector:

Non Adopters to E-mail Stage	E-mail stage to Static Stage	Static to Interactive Stage	Interative to transactive Stage
• Complexity • Security	• Observability • Market Force Influence • Technology Vendor Support	• Competitive Pressure	• Relative Advantage • Compatibility

Figure 5.2: Significant factors between sequential e-commerce adoption stages

Odds Ratio

To explain the differential effect of these significant factors between various sequential stages of e–Commerce adoption in a better way, odds ratio (Exp B) were examined. Odds Ratios depict that a unit change in predictor variable will change the odds of dependent variable (Hair et al., 2010). The Odds ratios more than one indicate positive relationship whereas ratio less than one indicate negative relationship. In the first column, Complexity and Security are having odds ratios less than one depicting negative relationship, so a unit increase in complexity and security concerns leads to the negative odds of 0.677 times and 0.648 times (respectively) for a company to be at the higher stage than in non-adopters stage which means that more complex and more insecure the adoption process, the more chances are that the enterprises will be at Non-Adopters stage. So, it is a sort of barrier for Non-Adopters to move to higher stages. In the second column, with every unit rise in Observability, Market Force Influence and Technology Vendor Support, there is 1.910, 1.579 and 2.459 respectively times higher odds of being in the static stage as compared to e-mail stage which means that when MSMEs observe others earning profits through e-commerce the more will be its adoption. Similarly, more the Technology vendors support and the pressure of trading partners, etc. the more chances are that the organization will progress to upper adoption stages. In the third column, with every unit rise in competitive pressure the odds of being in the interactive stage are 1.607 times higher than in static stage. It states that when an organization perceives more competitive pressure, it pressurizes these enterprises to move to advanced stages of adoption of technology in order to face the competition.

Lastly, with every unit increase in relative advantage and compatibility, there are 2.74 and 3.60 (respectively) times higher odds of being in Transactive Stage than being in Interactive Stage which means that higher the relative advantage of technology and its compatibility with the existing circumstances of the company the higher chances are there to move to higher stages of adoption.

Table 5.12: Odds Ratios for sequential e-commerce adoption stages

Factors	Non-adopters-E-mail Stage	E-mail-Static Stage	Static-Interactive Stage	Interactive-Transactive Stage
Relative Advantage				2.747
Compatibility				3.601
Complexity	.677			
Observability		1.910		
Security	.648			
Market Force Influence		1.579		
Technology Vendor Support		2.459		
Competitive Pressure			1.607	

Various studies on different nations suggest that MSMEs benefit the most at the higher levels of adoption as compared to the lower levels (KPMG and Google, 2017). Also, it has been reviewed in the literature before that it is not necessary for an enterprises to go through the prescribed sequence to achieve the higher stages of adoption. An enterprise may skip some stages and may at once accept the highest stage without going through the lower stages (Rao et al., 2003). So here, to achieve the objective, various lower e-commerce adoption stages were compared to the non-consecutive stages in order to understand the factors that affect the MSMEs to go to that higher non-consecutive stage. The following table identifies the significant factors that affect the MSMEs that are at lower stages of Non-adopters, e-mail stage, static stage to higher non-sequential stages i.e. static, interactive stage and the transactive stage:

Table 5.13: Showing influencing factors at non-sequential stages of e-commerce adoption

Variables/Stages of e-commerce adoption	Non-Adopters to Static stage		Non-Adopters to Interactive stage		Non-Adopter Vs. Transactive stage		E-mail stage to Interactive stage		E-mail Vs. Transactive Stage		Static Vs. Transactive Stage	
	β	Sig.	β	Sig.	β	Sig.	β	Sig.	β	Sig.	β	Sig
Relative Advantage	.207	.281	.416	.071	1.427	**.003**	.303	.192	1.31	**.006**	1.22	**.009**
Compatibility	.721	**.002**	.727	**.004**	2.008	**.000**	.368	.123	1.64	**.001**	1.28	**.006**
Complexity	-.405	.056	-.671	**.009**	-1.18	**.002**	-.280	.278	-.789	**.042**	-.775	**.040**
Trialability	-.206	.396	.156	.571	.246	.499	-.087	.756	.004	.992	.452	.172
Observability	.616	**.010**	.312	.245	.401	.219	.343	.201	.432	.184	-.215	.478
Cost	-.041	.854	-.281	.301	-.146	.705	-.474	.081	-.338	.377	-.105	.779
Security	-.663	**.001**	-.711	**.002**	-.847	**.011**	-.276	.214	-.413	.210	-.185	.563
Owner's Characteristics	-.104	.598	.094	.690	.135	.687	.262	.266	.303	.365	.239	.461
Organizatione-readiness	.537	.061	.772	**.008**	.966	**.006**	.489	.066	.682	**.036**	.429	.122
Market Force Influence	.265	.252	.435	.083	.644	**.033**	.627	**.011**	.836	**.005**	.379	.152
Technology Vendor Support	1.26	**.000**	1.06	**.004**	.744	.126	.695	.057	.378	.431	-.522	.252
Competitive Pressure	-.123	.634	.351	.120	.555	.113	.076	.782	.280	.416	.678	**.030**
National e-readiness	-.032	.888	.363	.219	-.170	.721	.580	**.050**	.046	.923	-.138	.767

The above table shows that the number of influencing factors is more where the gap between the lower stage and the higher non-sequential stages is more. Like, the number of increasing influencing factors is more when non-adopters stage was compared with transactive stage as compared to non-adopters and static stage. At the zero stage of adoption, i.e. at Non-adopters stage, various factors like perception of low Relative Advantage of technology, its Compatibility, Complexity, Security concerns, Organization e-readiness and low Market Force influence are the major determinants for jumping to transactive stage. Between Non-adopters and Static Stage, Compatibility, Observability, Security and Technology Vendor Support were significant. The comparison of Non-Adopters to Interactive stage showed Compatibility, Complexity, Security, Organization e-readiness and Technology Vendor Support as significant. At the e-mail stage to Interactive Stage Market Force Influence and National e-readiness were found significant. When e-mail stage was compared to Transactive stage, Relative advantage, Compatibility, Complexity, Market Force Influence and Organization e-readiness were found significant. At the Static Stage, again, the technological factors like Relative Advantage, Compatibility, Complexity have an influence. One more environmental factor of Competitive Pressure adds at this stage which shows that the MSMEs at Static Stage are feeling low Competitive Pressure as compared to MSMEs at Transactive stage which keeps them at lower stage.

Non-Adopters to Transactive Stage	E-mail to Transactive Stage	Static to Transactive Stage
• Relative Advantage • Compatibility • Complexity • Security • Organization e-readiness • Market Force Influence	• Relative Advantage • Compatibility • Complexity • Organization e-readiness • Market Force Influence	• Relative Advantage • Compatibility • Complexity • Competitive Pressure

(A)

Non-Adopters to Static Stage	Non-Adopters to Interactive Stage	E-mail to Interactive Stage
• Compatibility • Observability • Security • Technology Vendor support	• Compatibility • Complexity • Security • Organisation e-readiness • Technology Vendor Support	• Market Force Influence • National E-Readiness

(B)

Figure 5.3: Showing significant factors at non-sequential stages of e-commerce adoption

The above figure shows six models derived for MSMEs at different stages of e-commerce adoption for non-consecutive stages of growth of the technology.

Odds Ratios

The following Odds ratios (Exp. B) were calculated for various non-sequential e-commerce adoption levels. The first column compares Non-Adopters with MSMEs at Static Stage. The factors found significant were Compatibility, Observability, Security and Technology Vendor Support. The Odds ratios of these factors were 2.056, 1.851, .516 and 3.545 respectively. Odds ratios of Compatibility, Observability and Technology Vendor Support are positive being greater than one whereas the value is less than one for Security depicting negative relationship with outcome variable. So, it can be interpreted that with one unit increase in Compatibility, there will be 2.056 times higher odds of being in Static Stage than in Non-Adopters Stage keeping all other factors constant. Similar, interpretations are for Observability and Technology Vendor support. For Security, it can be stated that with each unit increase in Security concern there will be .516 decreasing odd of being in Static Stage. So, Security issues are inhibitors to develop in the use of e-commerce. For Non-Adopters and Transactive Stage, the number of significant factors was the highest. The strongest factor that discriminates between the two is

compatibility, followed by relative advantage and so on. For email and Interactive stage Market Force Influence and National e-readiness were significant which shows that with every unit increase in Market Force influence there is 1.872 times higher odds of being in interactive stage than in e-mail stage keeping all others factors constant. Similarly, with every unit increase in National e-readiness there are 1.786 times odds of being in interactive stage than in e-mail stage keeping all others factors constant. It means that greater the market force influence and stronger national infrastructure, the probability of being in upper e-commerce adoption levels is more. Again, in the e-mail stage, compatibility factor is having more influence than relative advantage although both were found significant. It means, greater the compatibility of e-commerce with culture, work practices, type of business, etc., the greater will be the possibility of being at the advanced e-commerce adoption levels. Lastly, Static stage was compared with Transactive stage and the results showed that Compatibility, Competitive Pressure and Relative Advantage are the positive factors whereas Complexity is deterrent to technology adoption.

Table 5.14: Odds ratio for non-sequential stages of e-commerce adoption

Variables	Non-Adopters-Static Stage	Non-Adopters-Interactive Stage	Non-Adopters-Transactive Stage	E-mail-Interactive Stage	E-mail-Transactive Stage	Static-Transactive Stage
Relative Advantage			4.165		3.719	3.386
Compatibility	2.056	2.068	7.447		5.201	3.622
Complexity		.511	.307		.454	.461
Observability	1.851					
Security	.516	.491	.429			
Org. e-readiness		2.165	2.62		1.978	
Market Force Influence			1.90	1.872	2.307	
Technology Vendor Support	3.545	2.889				
Competitive Pressure						1.970
National e-Readiness				1.786		

5.4 COMPARATIVE ANALYSIS OF ADOPTION OF E-COMMERCE BETWEEN TYPES OF ENTERPRISES

Another aim of the research was the comparative analysis of the adoption factors of e-commerce between manufacturing and services units of Punjab to find out any significant differences in the influencing factors between them. For this, means of factors were calculated and their significance was studied with the help of Mann-Whitney U test. The table below shows that the means and level of significance of various predictors for manufacturing and service enterprises do not show significant differences between them.

Table 5.15: Showing means of variables of types of enterprises with level of significance

Variables / Types of Enterprises	Manufacturing Enterprises	Services Enterprises	Level of Significance (p-value)
Relative Advantage	3.13	3.29	0.289
Compatibility	2.99	2.91	0.510
Complexity	2.66	2.50	0.208
Trialability	3.47	3.40	0.502
Observability	3.45	3.49	0.772
Cost	2.60	2.60	0.736
Security	2.98	3.09	0.242
Owner's Characteristics	3.13	3.21	0.448
Organization e-readiness	2.49	2.58	0.674
Market Force Influence	2.55	2.54	0.864
Technology Vendor Support	3.34	3.28	0.579
Competitive Pressure	2.64	2.78	0.113
National e-readiness	3.14	3.28	0.233

5.5 IDENTIFICATION OF BARRIERS AND FACILITATORS OF ADOPTION OF E-COMMERCE ADOPTION

Final aim of the research was the identification of barriers and facilitators of e-commerce adoption. Each predictor was studied in terms of its mean for different stages in order to understand whether it is a barrier and facilitator for a particular stage. The following table shows the means of various determinants of adoption of e-commerce at different adoption stages.

Table 5.16: Showing means of variables at different e-commerce adoption stages

Variables / e-commerce adoption stages	Non-Adopters	E-mail stage	Static Stage	Interactive Stage	Transactive Stage
Relative Advantage	2.59	2.87	3.36	3.83	4.42
Compatibility	2.23	2.55	3.16	3.61	4.30
Complexity	3.11	2.73	2.46	2.06	1.67
Trialability	3.05	3.30	3.47	3.87	4.00
Observability	3.09	3.25	3.77	3.86	3.95
Cost	2.98	2.92	2.47	2.14	1.89
Security	3.72	3.25	2.76	2.41	2.11
Owner's Characteristics	2.77	2.80	3.22	3.73	4.00
Organization e-readiness	1.95	2.21	2.58	3.22	3.64
Market Force Influence	2.15	2.14	2.61	3.02	3.48
Technology Vendor Support	2.86	3.07	3.56	3.78	3.91
Competitive Pressure	2.19	2.43	2.67	3.38	3.76
National e-readiness	2.78	2.79	3.06	3.51	3.73

The above table shows that means of some variables are increasing with the advancement in the stages of e-commerce whereas mean values concerning others are decreasing with successive stages of adoption. Like means of competitive pressure, triablability, observability, market force influence, organization e-readiness, owners' characteristics, compatibility, national e-readiness, relative-advantage and technology vendor support are increasing as the levels of e-commerce adoption is increasing, indicating that higher these variables the higher will be the stages of adoption. Similarly, higher the perception of cost, complexity, security issues the lower will be adoption of e-commerce. It was also observed in the table that same factor was acting as a barrier for some stagers and as a facilitator for other stagers. So, a staged study has given more insights regarding the determinants of adoption of e-commerce. The factors that are acting either as a facilitator or barrier for MSMEs in their decision to embrace the e-commerce have been discussed below:

Relative Advantage: Relative advantage of technology in terms of improved job performance, profitability, better access to information, etc. is having a mean value of more than 3 where likert scale measures rises from 1 to 5 for strongly disagree to strongly agree. It shows that this factor is a great facilitator in the adoption of e-commerce as with its rise, the stage of adoption is rising. So, we can say that the greater the relative advantage of technology, the more will be its adoption. Table 5.16 is showing the Relative Advantage's mean value of 2.59 which is the lowest in case of non-adopters because they perceive e-commerce to carry low advantage for their businesses. So, the lower two stages i.e. non-adopters and e-mail stagers perceive relative advantage of technology as a barrier to move further. But as the stage of adoption rises, the mean value of relative advantage increases which shows that the confidence of the MSMEs regarding the relative advantage of the technology improves with each higher step of adoption. The table 5.17 depicts the detail of the mean values of various items of relative advantage. It shows that most of the CEOs/Managers agree that e-commerce improves the access to information.

Table 5.17: Mean values of relative advantage

Relative Advantage	Mean
EC increases profitability	3.19
EC improves the market share for products and services	3.17
EC provides better access to information	3.50
EC improves job performance	3.14
EC provides new business opportunities	3.16
EC is cost efficient	3.18
EC saves time and efforts	3.21
Total	**3.22**

Compatibility: Compatibility is overall a barrier as it has got a mean value of 2.94. MSMEs feel that the e-commerce do not fit with their business type, their IT infrastructure, values, etc. E-commerce is incompatible for non-adopters and e-mail stages so it hinders its acceptance at these stages. But it is observed in table 5.16 that as compatibility improves, the stage of adoption rises. So, it becomes a facilitator for higher stages. The details given below shows that 'e-commerce does not fit with the type of business' and 'incompatible with existing IT infrastructure' were the major concerns among others:

Table 5.18: Mean values of compatibility

Compatibility	Mean
EC fits with our type of business	2.80
EC fits with our present IT infrastructure	2.79
EC fits with the values of our business	3.07
EC fits with the culture of our organization	3.08
EC is compatible with our work practices	2.97
Total	2.94

Complexity: Complexity is a negatively coded variable and it scores below three which proves that overall it is not a barrier for MSMEs taken collectively irrespective of their stages of adoption. But taken individually, it is found as barrier

for Non-Adopters as the mean is above 3 as shown in table 5.16. These enterprises are having perception that use of e-commerce is difficult and it takes long time to learn as it requires different skills. The biggest hindrance was their perception that e-commerce adoption needs different skills as it scores the highest at 2.72. But, the enterprises at higher stages are more confident and find it easier to use and thus is not a barrier for them.

Table 5.19: Mean values of complexity

Complexity	Mean
Use of EC is not easy for our employees	2.51
It takes a long time to learn using EC	2.46
Use of EC is not easy for parties related to the organization	2.60
EC requires different skills	2.72
Total	2.57

Trialability: Trialability is a facilitator for all sorts of enterprises as the score is above 3. Although the non-adopters were not in much favor of trialibility as the mean score is the lowest for them, but still as the value was above 3, it can said that the enterprises at different levels of use of technology feel that trialability option help in taking the decision on the adoption of e-commerce because it improves confidence of users. The biggest consoling point was that they considered that nothing much will be lost in trying the e-commerce, even if found not useful. This item was having the mean value the highest with 3.49. But trialability was not a significant facilitator for any stage of e-commerce adoption.

Table 5.20: Mean values of trialability

Trialability	Mean
Trialability (trial) option helps in deciding to adopt EC	3.33
Trialability options will improve my confidence to adopt EC	3.47
Nothing much will be lost in trying EC, even if found not useful	3.49
Total	3.43

Observability: Observability is also a facilitator having mean value of above 3 which depicts that when other enterprises using e-commerce and getting benefits through its use are observed, it helps in the acceptance of the technology. Again, even if it is the lowest for non-adopters, but still it is above three indicating that when MSMEs observe other enterprises getting benefit through e-commerce, it promotes its adoption in others also. Observability was found statistically significant between MSMEs at e-mail stage and static stage indicating that static stage MSMEs were more positive for this factor as compared to e-mail stagers to go to advanced stages.

Table 5.21: Mean values of observability

Observability	Mean
Observing others using EC will help in its adoption	3.38
Observing others benefitting from EC use will help in its adoption	3.46
The more the use of EC can be communicated to others the more will be its adoption	3.59
Total	3.47

Cost: Cost is measured on a likert scale ranging from strongly disagree to strongly agree with the values assigned 1 to 5. It is not a barrier as the overall mean score is 2.60 which is below the average of 3. It is the greatest for non-adopters with the mean value of 2.98 which means they somewhat agree that it is a hindrance, but as the value is under three it can be said that cost of the technology is not a major problem. As this factor was found insignificant, so it does not influence the MSMEs regarding e-commerce adoption.

Table 5.22: Mean values of cost

Cost	Mean
Cost of ICT(system, applications, etc.) for EC is not affordable	2.57
Cost of EC installation is high	2.56
Cost of Training is expensive	2.54
Cost of maintenance and updating the system is not affordable	2.62
Cost of investment in e-commerce is above the expected return on investment	2.72
Total	2.60

Security: Security is a negatively coded variable and is acting as a barrier for the enterprises as the overall mean score is 3.05. The enterprises are more worried about the unreliability of the technology by the parties connected to the business, danger of data hacking, viruses, etc. The worry is the greatest for non-adopters with the mean value of 3.72 followed by e-mail stagers at 3.25. But as the stage of adoption rises, this fear flies.

Table 5.23: Mean values of security

Security	Mean
EC lacks backing of strong cyber laws	2.86
Lack of sufficient security for online payment and transaction	2.90
Our firm does not want to take risk of hacking of data	3.11
We are afraid of viruses in the use of EC	3.18
EC is considered unreliable by the parties.	3.20
Total	3.05

Owner's Characteristics: Owner's Characteristics is overall a facilitator for MSMEs. It has a low mean value for non-adopters and e-mail stagers that is below three. But as per the views of the enterprises at higher stages, the characteristics of owners hold great value in deciding about the adoption of the technology. So, the positive characteristics of the owners are acting as a facilitator for e-commerce adoption at higher stages. The innovativeness and the risk taking behavior of the owners or CEOs of the MSMEs are a great facilitator in the adoption of e-commerce. But overall it is not a significant facilitator for MSMEs.

Table 5.24: Mean values of owner's characteristics

Owner's Characteristics	Mean
Owner/CEO's awareness of e-commerce benefits helps in its adoption	3.18
Owner's/CEOs level of education effects the adoption of EC	3.15
Our Onwer's/CEO's innovativeness promotes use of EC	3.29
Owner's/CEO's gender effects the adoption of EC	3.02
Owner's/CEOs age effects the adoption of EC	3.11
Owner's/CEOs risk taking behavior influences the adoption of EC	3.34
Total	3.18

Organization e-readiness: Organization e-readiness is a barrier for MSMEs with an overall mean score of 2.54. Non-Adopters, e-mail and static stagers are getting mean value of below 3 which means that their organization is not ready for the adoption or moving to higher stages of adoption. They don't have required IT resources. They lack financial and skilled resources as compared to organizations at higher stages But, it is a facilitator for interactive and transactive staged MSMEs with a mean value above 3.

Table 5.25: Mean values of organization's e-readiness

Organization's e-readiness	Mean
Size of firm effects the adoption of EC	2.60
Our organization have the required IT (software and hardware) resources	2.50
Our organization have the required financial resources	2.50
Our organization have required skilled human resources	2.58
The employees of the organization are receptive to new technology	2.56
Total	2.54

Market Force Influence: It is a barrier for MSMEs. The enterprises at Non-Adopters, e-mail and static stage are showing mean value of less than 3 indicating that they are facing low or no pressure from their trading partners to adopt e-commerce, and don't believe that culture of trading through e-commerce is popular. But, for enterprises at interactive and transactive stage, it is acting as a facilitator because majority of their trading partners have already adopted e-commerce and pressurize them to adopt it too.

Table 5.26: Mean values of Market force influence

Market Force Influence	Mean
Majority of our Trading Partner have already adopted EC	2.43
Our suppliers and business partners pressurizes us to adopt EC	2.44
Changing customer preferences and lifestyle prompts us to adopt EC	2.66
Culture of trading with EC is prevalent in market	2.67
Total	2.55

Technology Vendor Support: Technology Vendor support is a facilitator with a value of 3.30. Non-adopters have a poor perception of technology vendor's support as they have got a mean value of 2.86. It is a great facilitator for the enterprises at higher stages of e-commerce adoption because the mean values are increasing with the increase in the stage of adoption of e-commerce.

Table 5.27: Mean values of Technology vendor support

Technology Vendor Support	Mean
Experienced technology vendors for developing EC applications are available	3.30
We get sufficient support of technology vendors for EC adoption	3.22
Technology vendors provide us quick solutions of problems when needed	3.32
Timely technical advice given by vendors intensifies the EC adoption	3.27
Technology vendors provide relevant information to us	3.43
Total	3.30

Competitive Pressure: Competitive Pressure is a barrier with an overall value of 2.72. MSMEs are not feeling great competitive pressure to adopt e-commerce. Enterprises at non adopters, e-mail and static are feeling it a barrier as these enterprises are not feeling any influence of competition in terms of its intensity, benefits derived by competitors from the use of e-commerce or from pressure of dominant players either to adopt e-commerce or to move to higher stages. At the same time, it is a sort of facilitator for enterprises at Interactive and Transactive stage. They understand the level of competition and the need to be competitive with the use of improved technologies.

Table 5.28: Mean values of Competitive Pressure

Competitive Pressure	Mean
Intensity of competition is compelling us to adopt EC	2.65
Enterprises adopting EC become more competitive	2.75
Use of EC by our competitors influence us to adopt it	2.75
Benefits derived by our competitors from EC prompt us to adopt it	2.83
Pressure from dominant players improves EC adoption	2.64
Total	2.72

National e-readiness: National e-readiness is a facilitator with a value of 3.08. It has got low means for non-adopters and e-mail stages indicating that their perception regarding it is that the national infrastructure is insufficient for the adoption of e-commerce. So, it is a barrier for them to grow with technology. But, interactive and transactive staged enterprises have more positive views regarding it thus this variable is a facilitator for them.

Table 5.29: Mean values of National e-readiness

National e-readiness	Mean
Telecommunication infrastructure (telephone network, internet, etc.) is adequate	3.00
Power Supply is smooth and sufficient to adopt EC	3.01
E-financial system (electronic exchange of funds) is good and reliable	3.19
Transport and Delivery system is satisfactory	3.32
Number of Internet service providers is sufficient	3.58
Total	3.08

The above result of barriers and facilitators of e-commerce adoption can be compiled in the following two tables.

Table 5.30: Significant Barriers and Facilitators of e-commerce based on mean value ignoring stage level differences

Variables	Level of Significance	Facilitators (Mean value)	Barriers (Mean value)
Relative Advantage	0.006	3.22	
Compatibility	0.000		2.94
Complexity (negatively coded)	0.000	2.57	
Security (negatively coded)	0.000		3.05
Organization e-readiness	0.001		2.54
Market Force Influence	0.013		2.55
Technology Vendor Support	0.001	3.30	

The table 5.30 shows the significant barriers and facilitators of e-commerce adoption in MSMEs of Punjab. It shows that Relative advantage, perception of low Complexity and Technology Vendor Support are the facilitators of e-commerce adoption whereas low Compatibility, low security, low Market Force Influence, low Competitive Pressure are the deterrents of e-commerce adoption.

Table 5.31 shows the significant barriers and facilitators of e-commerce adoption between various stages of adoption. The same factors that are barriers for MSMEs at a particular stage of e-commerce adoption were found facilitators for the enterprises at the higher level based on the mean and significant values of factors for that particular stage. The last column shows the stages that show significant results for that particular factor. The table shows that most of the barriers are faced at Non-Adopters Stage followed by the MSMEs at e-mail stage and so on. The barriers are turning into facilitators as the organization steps up in the level of technology adoption.

Table 5.31: Significant barriers and facilitators between various stages of adoption

Variable	Barrier (Based on mean value of that particular stage)	Facilitator (Based on mean value of a particular stage)	Significance in stage levels
Relative Advantage	Non-Adopters, E-mail stagers	Static, Interactive and Transactive	Non-Adop-Transactive E-mail-Transactive Static-Transactive Interact-Transctive
Compatibility	Non-Adopters, E-mail stagers	Static, Interactive and Transactive	Non-Adop-Transactive E-mail-Transactive Non-Adopters-Static Non-Adop-Interactive Interact- Transactive

Variable	Barrier (Based on mean value of that particular stage)	Facilitator (Based on mean value of a particular stage)	Significance in stage levels
Complexity	Non-Adopters	E-mail, Static, Interactive and Transactive Stagers	Non-Adop-Transactive Non-Adop-Interactive Non-Adopters-E-mail E-mail-Transactive Static-Transative
Observability	–	Non Adopters, Static	Non-Adopter-Static
Security	Non-Adopters, E-mail stagers	Static, Interactive and Transactive Stagers	Non-Adop-Transactive Non-Adop-Interactive Non-Adop-Static Non-Adop-E-mail
Organization e-Readiness	Non-Adopters, E-mail	Interactive and Transactive Stagers	Non-Adop-Transactive Non-Adop-Interactive E-mail-Transactive
Market Force Influence	Non-Adopters, E-mail, Static Stagers	Interactive and Transactive Stagers	Non-Adop-Transactive E-mail-Interactive E-mail-Static E-mail-Transactive
Technology Vendor Support	Non-Adopters	E-mail, Static, Interactive	Non-Adop-Static Non-Adop-Interactive E-mail-Static
Competitive Pressure	Static stagers	Interactive and Transactive	Static-Interactive Static-Transactive
National e-readiness	E-mail stagers	Interactive	E-mail-Interactive

CHAPTER – 6

DISCUSSION

In this chapter, various research questions of the study have been answered and test results of various hypotheses is shown. The detail of the chapter is as follows:

6.1 What is the extent of adoption of e-commerce adoption in the MSMEs of Punjab?

6.2 How the Technological factors affect the adoption of e-commerce between different levels of e-commerce adoption?

6.3 How the Organizational factors affect the adoption of e-commerce between different levels of e-commerce adoption?

6.4 How the Environmental factors affect the adoption of e-commerce between different levels of e-commerce adoption?

6.5 Do the Manufacturing and Service MSMEs differ on the basis of determinants of e-commerce adoption?

6.6 Test results of Hypotheses

6.1 EXTENT OF E-COMMERCE ADOPTION IN THE MSMEs OF PUNJAB

The extent of e-commerce adoption was studied in two ways i.e. in terms of percentage of MSMEs using prescribed electronic functions and the stage level of adoption of e-commerce. Regarding the use of electronic business functions, it was found that sending and receiving business mails was the most popularly used function which was performed by 57.8% of the respondents followed by having websites for just the advertisement of products and services which stood at 44.3%. Online product and market research was more common as compared to online research on consumer preferences and online research on suppliers. Third party websites were used by just 12.2% of the respondents. Regarding financial transactions, use of EFTs was more popular than the use of smart and credit cards. Advanced level functions like SCM and CRM were not used at present by any

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respondent. It was seen that as the level of advancement of functions grows, the percentage of MSMEs performing those functions was falling. About the future plan to use these functions less than 10% of the respondents show the positive interest. Regarding the size of enterprises, it was observed that the most common function in medium enterprises was just the advertisement of goods and services through the websites as 71.8% of the respondents from medium enterprises were having their websites for the said purpose. Sending and receiving business e-mails was the most popular business function performed at micro and small level enterprises having 53.6% and 58.5% respondents respectively in its favor. It was also seen that medium enterprises were more active in using the e-commerce applications when comparison was done with micro and small units as the percentage of respondents was high for all the functions in comparison with micro and small business units. On the basis of type of enterprise, it was seen that online marketing functions like research on consumer preferences, suppliers, product and market research were slightly more in services enterprises as compared to manufacturing enterprises. 61.3% of the respondents of manufacturing enterprises were sending and receiving business emails as compared to 55.2% in services enterprises. Own websites and third party websites use was slightly more in manufacturing enterprises. Regarding EFT, 43.5% of the respondents from manufacturing enterprises were using this function as compared to 29.8% of the respondents from services enterprises. So, it shows that online marketing was common in services enterprises whereas use of websites, static, interactive or third party websites was more in manufacturing enterprises.

Regarding the stages of adoption of e-commerce, it was observed that 35% of the enterprises were non-adopters. They didn't use internet for business and follow only traditional methods of trading. Around 18% were just at e-mail stage, 14% at static stage, 19% at interactive stage and finally 12% at transactive stage. On the basis of size of enterprises, it was observed that around 42% of the micro enterprises were non adopters and the percentage of non-adopters decreases as the size of the enterprise increases as it stands at 32% for small and 20% for medium enterprises. E-mail stage was common with small enterprises with around 23% of small enterprises as compared to 19.8% micro and 4.6% medium enterprises. Moreover, it was also seen that percentages of MSMEs at Static, Interactive and Transactive

stages were more in medium sized enterprises as compared to others with 25% at Static, 32% at Interactive stage and 17% at Transactive stage. On the basis of type of enterprise, it was observed that there was no major difference between manufacturing and services enterprises. It was observed that non-adopters were slightly more in case of service enterprises with 37.1% respondents as compared to 33.1% in manufacturing enterprises. Enterprises at Interactive and Transactive Stages were more in manufacturing enterprises with 20.8% and 12.8% respondents as compared to 17.6% and 11.7% of services enterprises at these stages respectively.

6.2 HOW THE TECHNOLOGICAL FACTORS AFFECT THE E-COMMERCE ADOPTION BETWEEN THE DIFFERENT STAGES OF ADOPTION?

Technological factors include Relative Advantage, Compatibility, Complexity, Trialability, Observability, Cost and Security. Different stages of e-commerce adoption include Non-adopters, e-mail stage, Static stage, Interactive stage and Transactive stage. Influence of technological factors at different stages of e-commerce adoption has been shown in two ways i.e. sequential as well as non-sequential.

Non Adopters to E-mail Stage	E-mail stage to Static Stage	Static to Interactive Stage	Interative to transactive Stage
•Complexity •Security	•Observability	•Nil	•Relative Advantage •Compatibility

Figure 6.1: Influence of technological factors at sequential growth in the adoption of e-commerce

The above figure shows the significant influencing factors between the sequential stages of adoption of e-commerce. First, a comparison of non-adopters with e-mail stage was done and it was found that complexity and security were significant which states that MSMEs at e-mail stage were more confident when compared to non-adopters in terms of complexity and security issues of technology. Secondly, MSMEs observability was significant between e-mail stage and Static Stage. Lastly,

the enterprises at transactive stage were feeling more Relative Advantage and Compatibility of the technology as compared to the interactive stage.

Literature review suggested that an enterprise may not follow all the steps to progress in the use of technology. It may skip some stages and may also adopt the highest stage starting from scrap. So, the lower stages of adoption were compared to the higher non-consecutive stages of e-commerce adoption to understand the various hurdles in the acceptance of technology. The following figure shows the various significant technological factors that hinder the technological growth of the MSMEs:

Non-Adopters to Transactive Stage	E-mail to Transactive Stage	Static to Transactive Stage
• Relative Advantage • Compatibility • Complexity • Security	• Relative Advantage • Compatibility • Complexity	• Relative Advantage • Compatibility • Complexity
Non-Adopters to static Stage	**Non-Adopters to Interactive Stage**	**E-mail to Interactive Stage**
• Compatibility • Observability • Security	• Compatibility • Complexity • Security	• Nil

Figure 6.2: Influence of technological factors at non-sequential stages of e-commerce adoption

The above figure shows that the at the zero stage of adoption, i.e. at Non-adopters stage, various factors like perception of low Relative advantage of technology, its Compatibility, Complexity, Security concerns are the major determinants for jumping to Transactive stage. At the e-mail stage, the determinants are same, except no significant security issues which shows that the MSMEs at e-mail stage are more confident as compared to non-adopters regarding security issues. At the static stage, again, the technological factors like Relative advantage, Compatibility, Complexity

have an influence. When compared Non-adopters to Static stage, Compatibility, Observability, Security were found as the influencing factors. A comparison of Non-adopters to Interactive stage showed Compatibility, Complexity and Security to be the major factors.

6.3 HOW THE ORGANIZATIONAL FACTORS AFFECT THE ADOPTION OF E-COMMERCE BETWEEN THE DIFFERENT STAGES OF ADOPTION?

There are two organizational factors studied in context of MSMEs, first is owner's characteristics and the second is organization's e-readiness. It was found that although Owner's characteristics were a great facilitator, but they did not significantly influence the adoption of e-commerce at various stages of its adoption. Secondly, Organization's e-readiness was significant at Non-adopters and e-mail stage implying that MSMEs at these two stages were not ready in terms of their financial, skilled human, IT resources, etc. to move to advanced stages.

Non-Adopters to Interactive Stage	Non-Adopters to Transactive Stage	E-mail to Transactive Stage
• Organization e-readiness	• Organization e-readiness	• Organization e-readiness
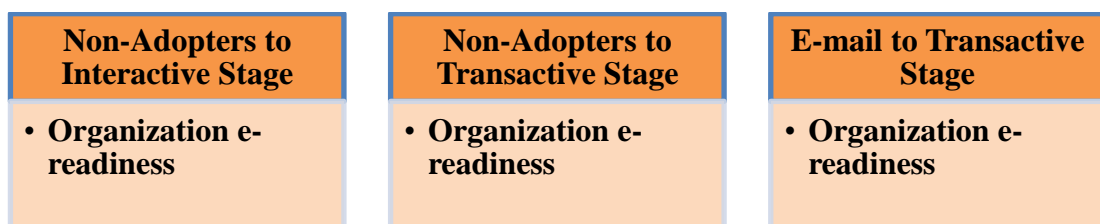
Figure 6.3: Influence of Organizational factors in e-commerce adoption

6.4 HOW THE ENVIRONMENTAL FACTORS AFFECT THE ADOPTION OF E-COMMERCE BETWEEN THE DIFFERENT STAGES OF ADOPTION?

Environmental factors include Market force influence, Technology vendor support, Competitive pressure and National e-readiness. It was found that market force influence was significant at Non-adopters and e-mail stage which means that MSMEs at these stages were not feeling any pressure from their trading partners to adopt e-commerce as they themselves have not adopted it yet. Similarly, they feel that the culture of trading in a traditional way is more prevalent as customers prefer to buy physically as compared to online methods. Technology vendor support was significant at e-mail stage while moving sequentially to higher stages and at non-

adopters stage when jumped to static and interactive stage. Competitive Pressure and National e-readiness were significant at e-mail stage which implies that MSMEs at this stage feel low competitive pressure as compared to higher staged MSMEs to move to higher stage and has a low perception of National e-readiness for adoption of e-commerce.

Non-Adopters to Transactive Stage	E-mail to Transactive Stage	Static to Transactive Stage
• Market Force Influence	• Market Force Influence	• Competitive Pressure

Non-Adopters to static Stage	Non-Adopters to Interactive Stage	E-mail to Interactive Stage
• Technology Vendor Support	• Technology Vendor Support	• Market Force Influence • National e-readiness

E-mail to static Stage	Static to Interactive Stage
• Market Force Influence • Technology Vendor Support	• Competitive Pressure

Figure 6.4: Influence of Environmental factors in e-commerce adoption

6.5 DO THE MANUFACTURING AND SERVICES UNITS DIFFER ON THE BASIS OF THE DETERMINANTS OF E-COMMERCE ADOPTION?

Another question of the research was to do comparative analysis of the e-commerce adoption factors between manufacturing and service enterprises of Punjab to find out any significant differences in the influencing factors between them. It was observed that the means and level of significance of various predictors for

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manufacturing and service enterprises do not show significant differences between them.

6.6   TEST RESULTS OF HYPOTHESIS

Thirteen alternate hypotheses were framed for the purpose of the study. The purpose was to understand the significant factors at various stages of e-commerce adoption. The significant factors were accepted, whereas insignificant ones were rejected. The detail is as follows:

TECHNOLOGICAL FACTORS

Hypothesis 1: Perception of relative advantage of e-commerce is significantly related to the decision to adopt it: Relative advantage of a technology is an important determinant of adoption in most of the studies. Technology has got various benefits in the form of increased profitability, market share, better access to information, improved job performance, new business opportunities, cost efficiency, etc. In the research, relative advantage of e-commerce was found significant at the following stages. So the hypothesis was accepted for these stages. The result supports the findings of various studies like Osorio-Gallego et al. (2016), Ocloo et al. (2018), Agboh (2015), Taylor and Owusu (2012), Rahayu and Day (2015), Mahroeian (2012), Alam et al.(2011), Hashim (2007), Seyal et al. (2004), Herzallah and Mukhtar (2016), Huy and Filiatrault (2006), Al-Somali et al. (2015), Alqahtani et al. (2012), Dlodlo and Dhurup (2013).
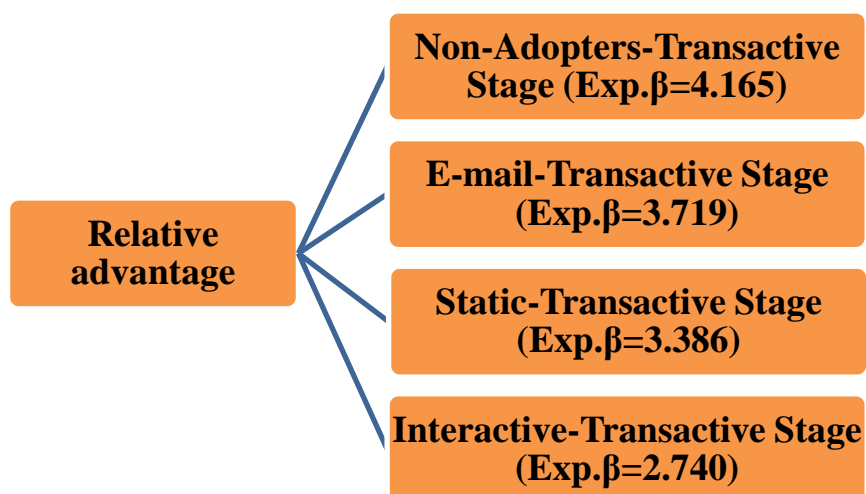

Figure 6.5: New Model for Relative Advantage

Hypothesis 2: Perception of compatibility of e-commerce with the existing system significantly influences the decision to adopt it: Compatibility of a technology with the existing IT infrastructure, type of business, values, culture and work practices have been earlier found to have significant effect on the decision to adopt e-commerce. In the research, compatibility was found significant between the following stages of e-commerce adoption. The results of various studies Azam and Quadddus (2009), Alam et al. (2011), Hashim (2007), Herzallah and Mukhtar (2016), Huy and Filiatrault (2006), Le et al. (2012), Dlodlo and Dhurup (2013) also support the findings of this study.
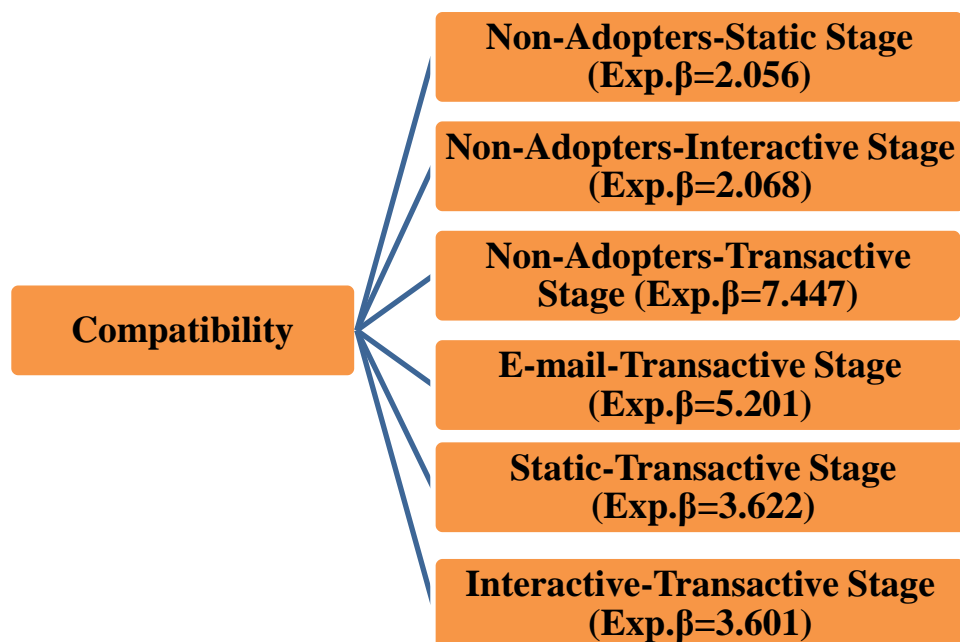
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                        ┌──────────────────────────────┐
                        │ Non-Adopters-Static Stage    │
                        │ (Exp.β=2.056)                │
                        ├──────────────────────────────┤
                        │ Non-Adopters-Interactive Stage│
                        │ (Exp.β=2.068)                │
                        ├──────────────────────────────┤
    ┌───────────────┐   │ Non-Adopters-Transactive     │
    │ Compatibility │───│ Stage (Exp.β=7.447)          │
    └───────────────┘   ├──────────────────────────────┤
                        │ E-mail-Transactive Stage     │
                        │ (Exp.β=5.201)                │
                        ├──────────────────────────────┤
                        │ Static-Transactive Stage     │
                        │ (Exp.β=3.622)                │
                        ├──────────────────────────────┤
                        │ Interactive-Transactive Stage│
                        │ (Exp.β=3.601)                │
                        └──────────────────────────────┘
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Figure 6.6: New Model of Compatibility

Hypothesis 3: Perception of complexity of e-commerce has inverse and statistically significant relation with its adoption: In various studies, it was found that the owners or CEOs of the MSMEs perceive e-commerce to be complex. They feel that it is not easy to use e-commerce and it takes a long time to learn its use. Moreover it was considered to be difficult for the parties to use this method of trading as it requires different skills. Various studies done by Osorio-Gallego et al. (2016), Agboh (2015), Macharia (2009), Mahroeian (2012), Hashim (2007), Herzallah and Mukhtar (2016), Makame et al. (2014), Huy and Filiatrault (2006), Le et al. (2012), Dlodlo and Dhurup (2013), Laosethakul and Boulton (2007) support

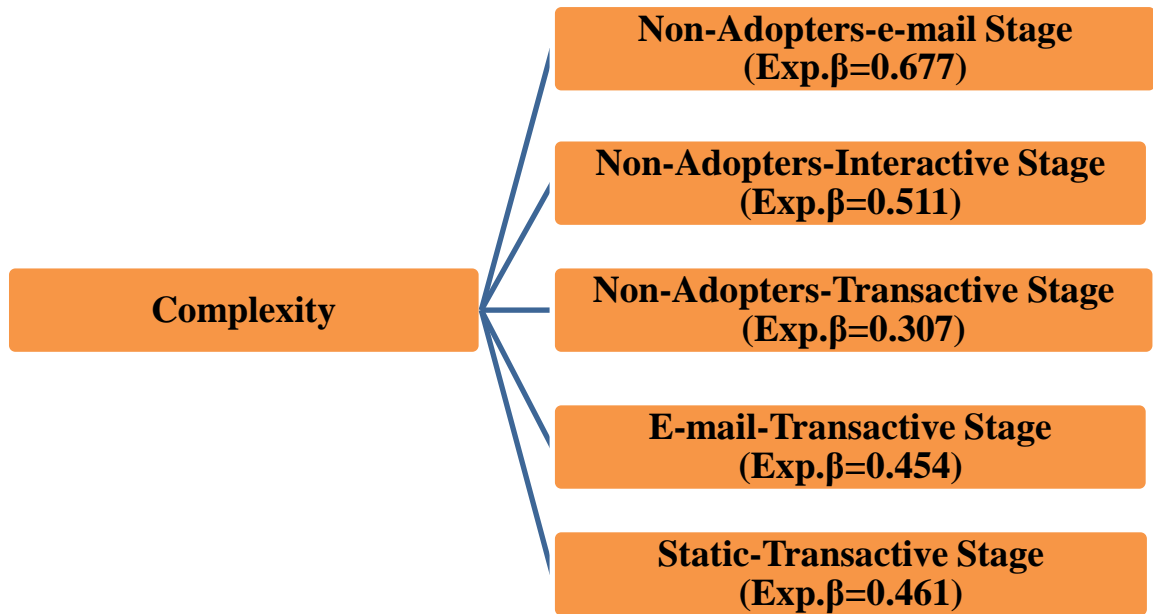the result of this research. In this study, complexity was found significant between the following stages.

Figure 6.7: New Model of Complexity

Hypothesis 4: Trialability has a significant influence on the decision to adopt e-commerce: Trialabilty is one of the important determinants of technology adoption (Rogers, 2010). Trialability options help in deciding the adoption of EC. It improves the confidence of the MSMEs to adopt EC. Some authors in previous studies found that owners of MSMEs are of the view that nothing much will be lost in trying e-commerce even if found not useful. But this factor is not explored much. In this study, trialbility was found insignificant at all the stages. Azam and Quadddus in 2009 also found it insignificant. So, the hypothesis gets rejected for all the stages of e-commerce adoption.

Hypothesis 5: Observability is significantly related to the adoption of e-commerce: Observability is the degree to which the result of the application of an innovation is noticeable, observed and communicated to others. Innovation will be adopted at a faster rate if its benefits can be observed by others (Azam and Quadddus, 2009). Also, the more the use of a technology can be communicated to

the potential adopters, the more will be the adoption (Rogers, 2010). Observability was found to be significantly related to e-mail to static stage of adoption. So the hypothesis gets accepted.

| Observability | — | E-mail-Static Stage (Exp.β=1.910) |

Figure 6.8: New Model of Observability

Hypothesis 6: Perception of Cost has a significant relation with the decision to adopt e-commerce: Cost includes the expenditure incurred on implementation of an innovation and consists of initial primary costs together with operating and maintenance expenses. It is usually said that a business should adopt an innovation only after having complete understanding of its expected benefits in contrast with its cost structure (Kapurubandara, 2009). High cost of investment in technology is an obstacle in its adoption in SMEs of developed as well as developing countries. In this research, cost was not found to have significant relationship with the various stage of e-commerce adoption. The result supports the results derived by Rahayu and Day (2015), Alam et al. (2011) in their studies. So, this hypothesis is rejected.

Hypothesis 7: Security concerns are significantly related with the decision to adopt e-commerce: Security is the degree to which an innovation is considered to be insecure for conducting online transactions. Security is a major concern in MSMEs while taking decision on the adoption of e-commerce. Insufficient security for online transactions and payments is a great hindrance in e-commerce adoption (Kwadwo et al., 2016). Some don't want to take risk of data hacking, some state that online transactions are highly unreliable (Al-Tit, 2020; Osorio-Galeggo et al., 2016), while others are afraid of viruses in the use of e-commerce (Saif-Ur-Rehaman and Alam, 2016). Higher the security concerns, the lower will be the adoption of e-commerce. In the present research, the hypothesis gets accepted between the following stages.
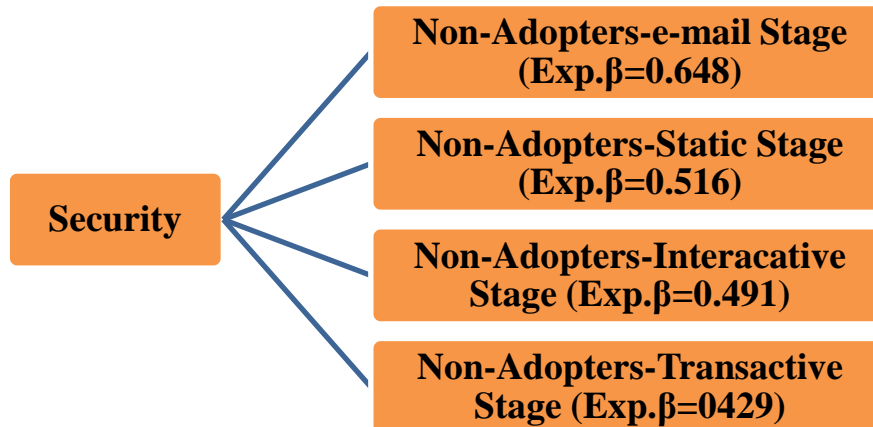
Figure 6.9: New Model of Security

ORGANIZATIONAL FACTORS

Hypothesis 8: Owner's Characteristics contribute significantly to the decision to adopt e-commerce: Owner is the person in whom ultimate decision making power of an enterprise is vested. He is the sole authority who has to take the decisions regarding the financial commitments of his firm (Macharia, 2009). Various items of survey are used to measure this factor. Some of them are 'owner's level of education' (Lip-Sam and Hock-Eam, 2011), 'owner's IT knowledge', 'owner's experience' (Rahayu and Day, 2015), 'owner's age' and 'owner's gender' (Alnaser et al., 2018; Macharia, 2009); 'owner's level of awareness' and 'owner's risk taking behavior' (Kabanda and Brown, 2015; Solaymani et al., 2012) are major influencing factors in the decision to adopt e-commerce in MSMEs. In this research this factor was not found significant. The result is consistent with the previous studies done by Seyal et al., 2004. So, the hypothesis is rejected.

Hypothesis 9: Organizational E-Readiness is a significant contributor to the decision to adopt e-commerce: Organization's e-readiness indicates presence of employee's technical skill and existence of business assets that help the adoption of e-commerce in MSMEs (Hassen and Svensson, 2014; Macharia, 2009). A variety of items of survey have been studied in various empirical researches relating to organizational e-readiness. Some of them are 'availability of financial resources' (Kusumaningtyas and Suwarto, 2015); size of firm (Macharia, 2009; Huy and Filiatrault, 2006), 'availability of IT resources', 'ICT skill of employees', (Dahbi

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and Benmoussa, 2019; Kabanda and Brown, 2015); 'employee's receptiveness of new technology', 'adaptability to change' (Seyal et al., 2004; Laosethakul and Boulton, 2007). Organizational e-readiness was found significantly related to non-adopters and e-mail staged MSMEs. This result is consistent with the studies conducted previously by Kabanda and Brown (2015), Kwadwo et al. (2016), Agboh (2015), Rahayu and Day (2015), Mahroeian (2012), Herzallah and Mukhtar (2016), Kapurubandara and Lawson (2014), Le et al. (2012), Hassen and Svensson (2014), Al-Bakri and Katsioloudes (2015), Kurnia et al. (2015), Al-Somali et al. (2015), Alqahtani et al. (2012), Nantembelele and Gopal (2018). So, the hypothesis gets accepted for non-adopters and e-mail staged MSMEs.
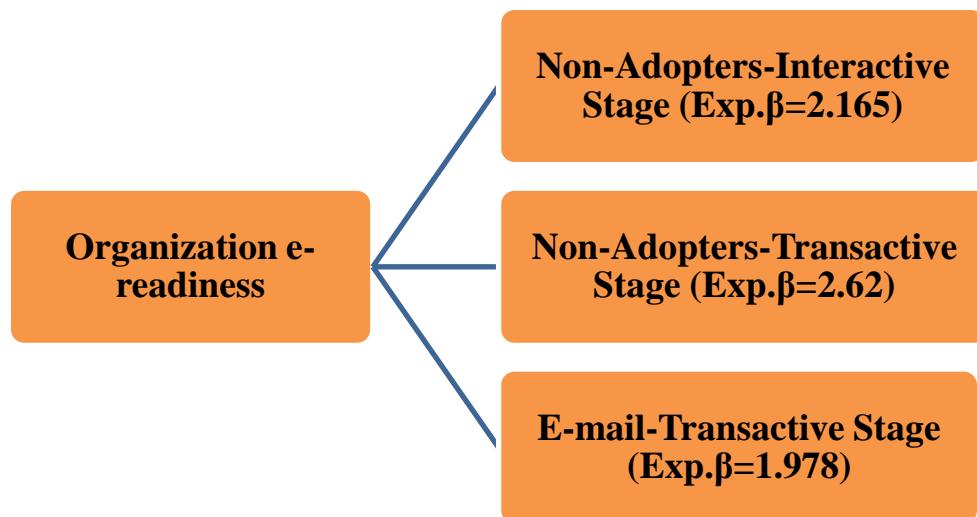
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┌─────────────────────┐         ┌──────────────────────────────┐
│                     │─────────│ Non-Adopters-Interactive     │
│                     │         │ Stage (Exp.β=2.165)          │
│                     │         └──────────────────────────────┘
│  Organization e-    │         ┌──────────────────────────────┐
│  readiness          │─────────│ Non-Adopters-Transactive     │
│                     │         │ Stage (Exp.β=2.62)           │
│                     │         └──────────────────────────────┘
│                     │         ┌──────────────────────────────┐
│                     │─────────│ E-mail-Transactive Stage     │
│                     │         │ (Exp.β=1.978)                │
└─────────────────────┘         └──────────────────────────────┘
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Figure 6.10: New Model of Organization's e readiness

ENVIRONMENTAL FACTORS

Hypothesis 10: Market Force Influence plays a significant role in the decision to adopt e-commerce: Another factor that influences the adoption of e-commerce by SMEs is influence of market force. This market force consists of trading partners, suppliers and buyers (Al-Somali et al., 2015). Various items of survey that has been explored to understand market force influence include culture (Le et al., 2012), use of e-commerce by trading partners (Ahmad et al., 2015); pressure of business partners, suppliers and customers on an organization to adopt e-commerce (Dahbi and Benmoussa, 2019; Al-Somali et al., 2015; Huy and Filiatrault, 2006). Market force influence was found significant at non-adopters and e-mail staged MSMEs.

The result is supported by previous studies conducted by Kabanda and Brown (2015), Le et al. (2012), Sarosa and Underwood (2005), Al-Bakri and Katsioloudes (2015), Kurnia et al. (2015), Al-Somali et al. (2015), Solaymani et al. (2012), Laosethakul and Boulton (2007), Zaied (2012), Altayyar and Beaumont-Kerridge (2016). So, the hypothesis is accepted for non-adopters and e-mail staged MSMEs.
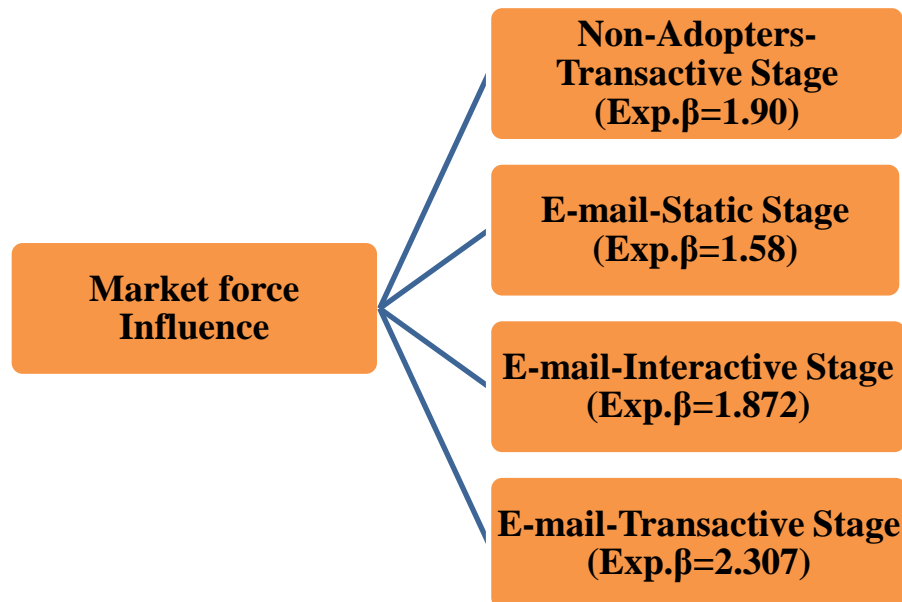

Figure 6.11: New Model of Market Force Influence

Hypothesis 11: Technology Vendor Support has a significant relation with e-commerce adoption: Technology vendors are the persons who provide sufficient support and counseling for facilitating the adoption of technology. They help in analyzing the needs of the business and recommend right infrastructure based on it and also help in its implementation (Saif-Ur-Rehaman and Alam, 2016). Qualified technology vendors promote the adoption of technology as they provide quick solutions and timely advice when needed (Kwadwo et al., 2016; Sarosa and Underwood, 2005). Technology vendors are also relied upon for the required training in the use of technology as well as sufficient support for their after sales services which helps in the promoting the adoption and use of technology (Dahbi and Benmoussa, 2019; Al-Somali et al., 2015). The result was that this factor was found significant for non-adopters and e-mail staged MSMEs. Various studies also found it significant viz. Kabanda and Brown (2015), Sarosa and Underwood (2005),

Al-Somali et al. (2015), Laosethakul and Boulton (2007), Kshetri (2007). So, this hypothesis is accepted for non-adopters and e-mail staged MSMEs.
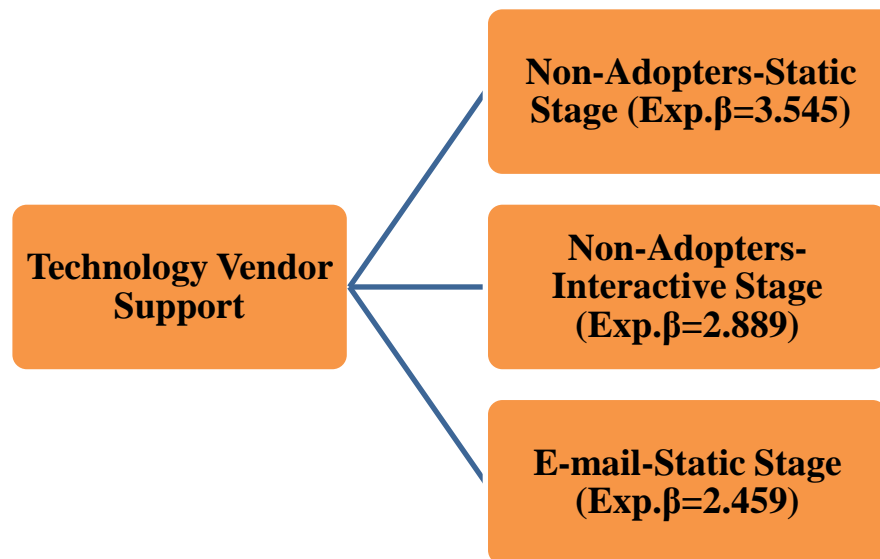

Figure 6.12: New Model of Technology Vendor Support

Hypothesis 12: Competitive Pressure significantly influences the decision to adopt e-commerce: Competitive Pressure means the intensity of e-commerce potential in the industry of a firm and of its competitors. As the competition amplifies, the firms begin to adopt e-commerce technologies more extensively to gain competitive advantage (Gibbs and Kraemer, 2004). Competitive pressure was found significant related to static stage of e-commerce adoption. The result was consistent with the outcomes of the previous studies done by Ocloo et al. (2018), Taylor and Owusu (2012), Chee et al. (2016), Dlodlo and Dhurup (2013), Zaied (2012), Hong (2005), Altayyar and Beaumont-Kerridge (2016), Sin et al. (2016), Mahroeian (2012). So, the hypothesis is accepted for static staged MSMEs.
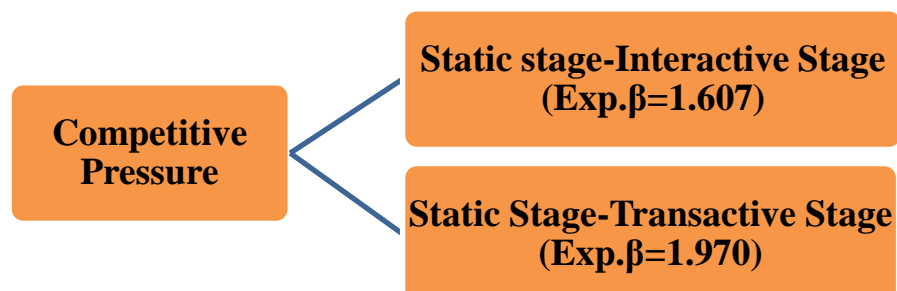

Figure 6.13: New Model of Competitive Pressure

Hypothesis 13: National E-Readiness is a significant contributor to the decision to adopt e-commerce: National e-readiness comprises of sound policies and rules that give protection and security to the online transactions within the parties (Osorio-Gallego et al., 2016; Kwadwo et al., 2016; Macharia, 2009). It also includes the existence of required national infrastructure and government support to promote e-commerce adoption in SMEs of developing nations (Osorio-Gallego et al., 2016). The more robust the infrastructure, the greater is the confidence among firms in the adoption of the technology. SMEs find some hindrances in the adoption of the technology like long power cuts and insufficient number of internet service providers (Dahbi and Benmoussa, 2019; Taylor and Owusu, 2012), lack of robust telecommunication infrastructure together with its unreliability and inefficiency (Kabanda and Brown, 2015; Oluyinka et.al., 2014). Other barriers include underdeveloped e-financial system like limited online banking services, low credit card penetration (Kapurubandara, 2009) and logistics challenges like inadequate transportation and delivery system (Kshetri, 2007). It was found significant between e-mail and Interactive Stage of e-commerce adoption. The result is consistent with the findings of Dahbi and Benmoussa, 2019; Taylor and Owusu, 2012, Kabanda and Brown, 2015; Oluyinka et al., 2014. So, the hypothesis is accepted for this stage of e-commerce adoption.

Figure 6.14: New Model of National e-readiness

The following table shows the results of the hypotheses of the study:

Table 6.1: Results of Hypothesis for sequential stages of e-commerce adoption

Factors/stages	Non-adopters-E-mail Stage	E-mail stage-Static Stage	Static stage-Interactive Stage	Interactive Stage-Transactive Stage
Relative advantage	Rejected	Rejected	Rejected	**Accepted**
Compatibility	Rejected	Rejected	Rejected	**Accepted**
Complexity	**Accepted**	Rejected	Rejected	Rejected
Trialability	Rejected	Rejected	Rejected	Rejected
Observability	Rejected	**Accepted**	Rejected	Rejected
Cost	Rejected	Rejected	Rejected	Rejected
Security	**Accepted**	Rejected	Rejected	Rejected
Owner's characteristics	Rejected	Rejected	Rejected	Rejected
Organization's e-readiness	Rejected	Rejected	Rejected	Rejected
Market force influence	Rejected	**Accepted**	Rejected	Rejected
Technology Vendor Support	Rejected	**Accepted**	Rejected	Rejected
Competitive Pressure	Rejected	Rejected	**Accepted**	Rejected
National e-readiness	Rejected	Rejected	Rejected	Rejected

Table 6.2: Result of Hypothesis for non-consecutive stages of e-commerce adoption

Factors/stages	Non-adopters-Static Stage	Non Adopters-Interactive Stage	Non-Adopters-Transactive Stage	E-mail-Interactive Stage	E-mail-Transactive Stage	Static-Transactive Stage
Relative advantage	Rejected	Rejected	**Accepted**	Rejected	**Accepted**	**Accepted**
Compatibility	**Accepted**	**Accepted**	**Accepted**	Rejected	**Accepted**	**Accepted**
Complexity	Rejected	**Accepted**	**Accepted**	Rejected	**Accepted**	**Accepted**
Trialability	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
Observability	**Accepted**	Rejected	Rejected	Rejected	Rejected	Rejected
Cost	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
Security	**Accepted**	**Accepted**	**Accepted**	Rejected	Rejected	Rejected
Owner's characteristic	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
Organization's e-readiness	Rejected	**Accepted**	**Accepted**	Rejected	**Accepted**	Rejected
Market force influence	Rejected	Rejected	**Accepted**	**Accepted**	**Accepted**	Rejected
Technology Vendor Support	**Accepted**	**Accepted**	Rejected	Rejected	Rejected	Rejected
Competitive Pressure	Rejected	Rejected	Rejected	Rejected	Rejected	**Accepted**
National e-readiness	Rejected	Rejected	Rejected	**Accepted**	Rejected	Rejected

CHAPTER – 7

CONCLUSION AND RECOMMENDATIONS

This chapter includes the conclusion of the study, together with some recommendations, limitations and the scope for future research. The details are as follows:

7.1   Conclusion

7.2   Limitations of study

7.3   Contribution of research

7.4   Recommendation

7.5   Scope for future research

7.1   CONCLUSION

The objective of the research was to study the extent of e-commerce adoption in the MSMEs of Punjab and to spotlight the factors that influence the managers and the CEOs of these enterprises to adopt e-commerce. The study has helped in understanding the factors of e-commerce adoption in the MSMEs of Punjab. As per some authors, technology adoption is a sequential process because an organization passes through various stages of technology adoption, whereas as per some authors, it is not necessary for an organization to pass through various stages of technology adoption, it may skip some stages or it may directly jump to peak phase. So, determinants of e-commerce adoption were also studied between various stages of its adoption. Finally, various barriers and facilitators of e-commerce adoption were found. Barriers and facilitators were different for enterprises at different stages. The conclusion of the research has been divided into various sub-sections on the basis of objectives as follows:

7.1.1 Extent of e-commerce adoption in the MSMEs of Punjab

The extent of e-commerce adoption was studied in both the terms of percentage of MSMEs using prescribed e-commerce applications as well as the stage level of e-commerce adoption. Regarding the use of e-commerce functions, it was found that sending and receiving business mails was the most popularly used function which

was performed by 57.8% of the respondents followed by having websites for the advertisement of products and services which stood at 44.3%. Online product and market research was more common as compared to online research on consumer preferences and online research on suppliers which stood at 39.8%, 33.1% and 27.6% respectively. Third party websites were used by just 12.2% of the respondents. Regarding financial transactions, use of EFTs was more popular than the use of smart and credit cards with 35.7% and 13.5% respondents respectively. Advanced level functions like SCM and CRM were not used at present by any respondent. It was seen that as the level of advancement of functions grows, the percentage of MSMEs performing those functions was falling. Regarding the future plan to use these functions, less than 10% of the respondents show the positive interest. Regarding the size of enterprises, it was observed that the most common function in medium enterprises was advertising their products and services on their websites as 71.8% of the respondents from medium enterprises were having their websites. Sending and receiving business e-mails was the most popular business function performed at micro and small level enterprises having 53.6% and 58.5% respondents respectively in its favor. It was also seen that medium enterprises were more active in the use of e-commerce applications as compared to micro and small enterprises as the percentage of respondents was high in medium enterprises for all the functions as compared to micro and small enterprises. On the basis of type of enterprise, it was seen that online marketing functions like research on consumer preferences, suppliers, product and market research were slightly more in services enterprises as compared to manufacturing enterprises. 61.3% of the respondents of manufacturing enterprises were sending and receiving business emails as compared to 55.2% in services enterprises. Own websites and third party websites use was slightly more in manufacturing enterprises. Regarding EFT, 43.5% of the respondents from manufacturing enterprises were using this function as compared to 29.8% of the respondents from services enterprises. So, it shows that online marketing was common in services enterprises whereas use of websites, static, interactive or third party websites was more in manufacturing enterprises. For the various types of manufacturing and services enterprises, the detail of various business functions performed electronically showed that research on consumer preferences and market research is most common in real estate business which

stands at 54.5 % and 72.2% resp. Research on suppliers was mostly done in agricultural and food processing enterprises with 46.1% doing the same. Sending and receiving of business e-mails was common in Printing and Packaging. 70.5% of the Sport goods enterprises were using own websites, 22.2% of Textiles and Hosiery enterprises used third party websites and made online sales, which was the highest as compared to others. Smart cards use was more popular with Hand and Machine tools manufacturing enterprises which stood at 34.7% whereas EFT was used by 77% of Agricultural and food processing enterprises.

Regarding the stages of e-commerce adoption it was found that 35% of the enterprises were non-adopters. They didn't use internet for business and follow only traditional methods of trading. Around 18% were just at e-mail stage, 14% at static stage, 19% at interactive stage and finally 12% at transactive stage. On the basis of size of enterprises it was observed that around 42% of the micro enterprises were non adopters and the percentage of non-adopters decreases as the size of the enterprise increases as it stands at 32% for small and 20% for medium enterprises. E-mail stage was common with small enterprises with 23% of small enterprises as compared to 19.8% micro and 4.6% medium enterprises. Moreover, it was also seen that percentages of MSMEs at Static, Interactive and Transactive stages were more in medium sized enterprises as compared to others with 25% at Static, 32% at Interactive stage and 17% at Transactive stage. On the basis of type of enterprise, it was observed that there was no major difference between manufacturing and services enterprises. It was observed that non adopters were slightly more in case of service enterprises with 37.1% respondents as compared to 33.1% in manufacturing enterprises. Enterprises at Interactive and Transactive Stages was more in manufacturing enterprises with 20.8% and 12.8% respondents as compared to 17.6% and 11.7% of services enterprises at these stages respectively. On the basis of various types of manufacturing and services enterprises, it was observed that hospitality enterprises with 54.5% of the total had the highest number of non-adopters as compared to others. E-mail stage was most common in Finance and Insurance enterprises with 31.25% of the total enterprises in that group. Consultancy enterprises were more prevalent at static stage with 29.1% of the total. Interactive stagers were more in Hand and Machine making tools enterprises with 34.7% of the

total and the Transactive Stage was most popular with Hosiery and Textiles manufacturing enterprises with 22.2% of the total respondents from sports goods making enterprises doing online sales.

7.1.2 Factors influencing the adoption of e-commerce using a proposed research model

Regarding the factors influencing the adoption of e-commerce, Ordered Logistic Regression was applied because the dependent variable was ordered in terms of stages of e-commerce adoption and it was found that Relative Advantage, Compatibility, Complexity, Security, Organization e-readiness, Market force influence and Technology vendor support were significant. The direction of coefficients of Relative Advantage, Compatibility, Organization e-readiness, Market Force Influence and Technology Vendors support was positive with values 0.301, 0.552, 0.417, 0.284, 0.573 respectively, indicating that with the increase in these factors, the odds of the MSMEs at the higher stages of adoption of e-commerce increases. However, the direction of coefficients of Complexity and Security were negative with values -0.510 and -0.445 which states that with the increase in Complexity and Security issues of technology adoption the odds of MSMEs in the higher stages of adoption decreases.

7.1.3 E-commerce influencing factors between various stages of adoption

Another objective was to study the e-commerce influencing factors between various stages of e-commerce adoption. Technology adoption is a process. With the passage of time, an organization moves upwards through various stages of adoption and may sometime skip some stages and move up to advance levels of technology adoption. As per various researchers, the factors of technology adoption are different at different stages of its adoption. A factor may be a barrier for an enterprise at lower stage and it may be a facilitator for some enterprise at some other stage. So, there was a need to study the influencing factors between various stages of e-commerce adoption. For this purpose, comparison within different stages was done in two ways, one is sequential process and the other is non-consecutive process where an enterprise may skip some in between stages of technology adoption. In the sequential stages, four comparisons were made: Non-Adopters with E-mail stage, E-

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mail with Static Stage, Static with Interactive Stage and Interactive with Transactive Stage. For interpretation of results, odds ratio (Exp B) were examined. Odds Ratios depict the change in the odds of outcome variable with a unit change in predictor variable (Hair et al., 2010). Odds ratio more than one indicates positive relationship, whereas ratio less than one indicates negative relationship. In comparison of Non-Adopters with e-mail stagers, it was found that Complexity and Security were significant factors. Complexity and Security were having odds ratios less than one depicting negative relationship so a unit increase in complexity and security leads to the negative odds of 0.677 times and 0.648 times (respectively) for a company to be at the higher stage than in non-adopters stage. For comparison between e-mail and Static Stagers, Observability, Market Force Influence and Technology Vendor Support were found significant. Their odds ratio indicate with each unit increase in these factors there is 1.910, 1.579 and 2.459 times respectively higher odds of being in the static stage as compared to e-mail stage. The comparison between Static and Interactive Stagers indicate that Competitive Pressure was significant. So, with every unit rise in competitive pressure, the odds of being in the interactive stage were 1.607 times higher than in static stage. Lastly, a comparison of Interactive and Transactive Stagers show that Relative Advantage and Compatibility were significant. With every unit increase in Relative Advantage and Compatibility, there were 2.74 and 3.60 (respectively) times higher odds of being in Transactive Stage than being in Interactive Stage.

For the comparison between non-sequential stages of e-commerce adoption, six models were compared i.e. Non-Adopters and Static Stagers, Non-Adopters and Interactive Stagers, Non-Adopters and Transactive Stagers, e-mail and Interactive Stagers, e-mail and Transactive Stagers and Static and Transactive Stagers. The Odds ratios (Exp. B) were calculated for various non-consecutive stages of e-commerce adoption. Comparison of Non-Adopters with MSMEs at Static Stage showed that Compatibility, Observability, Security and Technology Vendor Support were significant. The Odds ratios of these factors were 2.056, 1.851, 0.516 and 3.545 respectively. Odds ratios of Compatibility, Observability and Technology Vendor Support are positive with value greater than one whereas the value is less than one for Security depicting negative relationship with outcome variable. So, it

can be interpreted that with one unit increase in Compatibility, Observability and Technology Vendor Support, there will be 2.056, 1.851 and 3.545 times higher odds of being in Static Stage than in Non-Adopters Stage and for Security it can be stated that with each unit increase in Security concern there will be 0.516 times decrease odd of being in Static Stage. So Security issues are inhibitors to develop in the use of e-commerce. For Non-Adopters and Transactive Stage, the number of significant factors was the highest. The strongest factor that discriminates between the two is compatibility, followed by relative advantage and so on. For email and Interactive stage Market Force Influence and National e-readiness were significant and their odds ratio 1.872 and 1.786 indicate that with every unit increase in Market Force influence and National e-readiness, there is 1.872 and 1.786 times higher odds of being in interactive stage than in e-mail stage. It means that greater the market force influence and stronger national infrastructure, the probability of being in higher stages of e-commerce adoption will be high. Again, the comparison of e-mail stage with transactive stage showed Relative Advantage, compatibility, Organization e-readiness and Market Force Influence as significant factors. Compatibility factor was having more influence than relative advantage although both were found significant. It means greater the compatibility of e-commerce with culture, work practices, type of business, etc., the greater will be the possibility of being at the higher stages of e-commerce. Lastly, Static stage was compared with Transactive stage and it was found that with each unit increase in Relative Advantage, Compatibility, Competitive Pressure are the positive factors whereas Complexity is deterrent to technology adoption

7.1.4 Comparative Analysis of e-commerce adoption factors between Manufacturing and Services enterprises of Punjab

Another objective of the research was to do comparative analysis of the e-commerce adoption factors between manufacturing and service enterprises of Punjab to find out any significant differences in the influencing factors between them. For this, means of factors were calculated and their significance was studied with the help of Mann-Whitney U test. It was found that the means and level of significance of various predictors for manufacturing and service enterprises do not show significant differences between them.

7.1.5   Barriers and Facilitators of e-commerce adoption

For this purpose, barriers and facilitators were observed in two ways. First, was to observe the overall means and level of significance of factors without taking into consideration different stages of adoption where it was found that Relative Advantage of Technology, low Complexity and Technology Vendor Support were the facilitators and low Compatibility, Security Concerns, low Market Force Influence, low Organization e-readiness were the barriers in e-commerce adoption. Secondly, barriers and facilitators were found for the different stages of e-commerce adoption. It was found that the same factors that were barriers for MSMEs at a particular stage of e-commerce adoption were found facilitators for the enterprises at the higher level based on the mean and significant values of factors for that particular stage. Moreover, most of the barriers were faced at Non-Adopters Stage followed by the MSMEs at e-mail stage and so on. The barriers were turning into facilitators as the organization stepped up in the level of technology adoption.

7.2   LIMITATIONS OF THE STUDY

The limitations of the study are as follows:

- Data was collected from three districts of Punjab only due to which it lacks generalizations.
- Variables of study were derived from existing literature. There may be some other significant variables which may affect the adoption of e-commerce.
- The low level of understanding, the lack of education, unwillingness to cooperate, busy schedules, etc. may have affected the precision of the results.

7.3   RESEARCH CONTRIBUTION

This research has contributed both theoretically and practically. Theoretically, it has helped in creating a new model of e-commerce adoption factors based on the review of literature. For this purpose, various theoretical models of renowned authors were studied and a combined DOI and TOE model was derived. Further various empirical studies concerning the e-commerce adoption factors in developing nations were gone through in order to understand the adoption factors in a better way. Thus, a research model was derived to be used in the research on the MSMEs of Punjab.

This model was further pooled with a staged model, which was in turn derived from various stage level technology adoption models framed by highly cited studies. Staged model helps in deciding the various determinants of e-commerce adoption at different levels of adoption. As an organization seldom remains at one stage of adoption of technology and it gradually evolves with it and it was observed in this research that the perception of determinants is different at different levels of adoption. So, this model is a good theoretical contribution of the research.

Practically, it has spotlighted various factors that influence the adoption of e-commerce in the MSMEs of Punjab. These significant factors have different implications for MSMEs at different stages of its adoption. The same factor can act as barrier for one organization at one stage and facilitator for the other organization at some other stage of adoption. So, it will help the managers/CEOs/Owners of MSMEs at a particular stage of e-commerce adoption to understand these barriers and facilitators in a better way. The managers of MSMEs will assess their present level of adoption and strategically plan for the higher levels until the maturity peak is reached. This study will also benefit academicians and the students as it will provoke the interest in this sphere of study and will also guide for future research. Government will also try to frame policies for the promotion of e-commerce use in these enterprises and thereby raising the GDP of the state.

7.4   SUGGESTIONS AND RECOMMENDATIONS

The study has highlighted the barriers and the facilitators of e-commerce adoption. An effort is required to boost the facilitators further and remove the barriers in order to promote the adoption of this technology in the MSMEs of Punjab.

1) As the Non-Adopters are finding the use of e-commerce a complex process, so, some compulsory training programs are required to be organized at either low or free of cost for these MSMEs to make them more skilled with the use of technology. Further, training to employees will not only make them more skilled but more receptive to technology also. So, it will address the barrier named 'Organization e-readiness'.

2) Security concerns need to be addressed as they hinder the adoption of technology. Strong cyber laws should be framed which will make the

owners/managers of MSMEs more confident with e-commerce. Various security tools are required to be devised and proper training should be given to them regarding its use. Technology Vendors may also provide some support regarding this issue.

3) As most of the respondents were of the view that they lack financial and IT resources so, there is an urgent need to financially empower them with easy finance facilities. Moreover various incentives schemes in terms of tax exemption on the purchase of ICT products, internet access at low cost, etc. can be framed to enhance the process of technology adoption.

4) Government of India has launched the programs like 'Digital India' and 'Skill India'. There is a need on the part of government of Punjab to frame some effective policies to ensure its maximum benefits to MSMEs, they being an engine of growth of Indian economy. Some award and recognition should be attached for the MSMEs adopting it. Various training programs should include some ICT as compulsory part of the course curriculum to boost the adoption of e-commerce. The barriers like low Market Force Influence and Low Competitive Pressure, Low Compatibility will get eliminated if government tries to step forward with its sound policies and awareness programs to push one and all towards being a part of 'Digital India'.

Some Positive Steps by Government of Punjab worth mentioning

In order to promote e-commerce in MSMEs, Punjab Government has signed an MOU with the state based e-commerce player Pumpkart in Nov., 2019 to support and encourage the entrepreneurs who think big. Pumpkart has designed an App which will help the manufacturers to find the retailers for their products who otherwise sell most of their products in unorganized sector due to difficulty in finding the retailers. It also provides working capital lending to the retailers to increase their buying capacity. Other MOUs were signed in Dec., 2019 by the state government with Flipkart and Amazon. As per the MOU, Amazon and Flipkart will organize for training and on-boarding workshops at key MSME clusters including Ludhiana, Jalandhar and Amritsar which will help MSME exporters get onboard Amazon's 12 International marketplaces. Sibin C, Managing Director of Punjab Small Industries and Export Corporation (PSIEC) said that a lot of awareness is

required to promote e-commerce for which the government has been organizing various awareness camps. So, Punjab government is set ready to give a big boost to its MSMEs. Although, bringing MSMEs on online platform is not a one day show. It will take time to bring the required fruit. But it is well said that 'A good beginning makes a good ending'.

7.5   FURTHER RESEARCH AREAS

Research is a never ending process. Future research can be conducted in the following areas:

1)   Comparative study of some states regarding the e-commerce adoption factors.
2)   Impact of e-commerce adoption on the MSMEs can be studied.
3)   Qualitative and longitudinal studies can be done in order to understand in detail the ground realities of these enterprises.
4)   Current model of e-commerce may be extended to add some more construct in order to further validate the model.
5)   Factors concerning some other online methods like social media, mobile-commerce, etc. can be explored.

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DETERMINANTS OF E-COMMERCE ADOPTION AMONG MICRO, SMALL AND MEDIUM ENTERPRISES OF PUNJAB

<u>QUESTIONNAIRE</u>

Name of the Company : _____District_____

Your Name:_____ Contact No: _____

Gender: ☐ Male   ☐ Female

Age: _____ Educational Qualification: _____

Type of Enterprise: ☐ Manufacturing   Item of Manufacture_____

☐ Services   Specify the type of Service_____

Annual Turnover (Approx. Rs.)_____

Age of the Firm**:**   ☐ Less than 1 year   ☐ 1-2 years

☐ 2-5 years   ☐ 5-10 years

☐ Above 10 years

Size of Enterprise: ☐ Micro   ☐ Small   ☐ Medium

Investment in Plant and Machinery or Equipment (Rs.):

☐ Below 10L   ☐ 10L-25L

☐ 25L-1Cr   ☐ 1Cr-2Cr

☐ 2Cr-5Cr   ☐ 5Cr-10Cr

☐ Above 10Cr

Stage of Adoption of E-Commerce in your enterprise:

Stage	e-Commerce Adoption Stages	Features	Response (Tick Marks)
Zero	Non-Adopters	At stage zero, internet is not used, traditional methods of trading are followed.	
1	e-mail stage	Here, MSMEs use e-mails for Business purpose ONLY but don't have their own websites.	
2	Static Stage	At stage 2, an enterprise has a simple Homepage/Website that allows for advertising ONLY, without any interaction.	
3	Interactive Stage	At this stage, an enterprise has an interactive Homepage/Website that allows for advertising, detailed enquiry of company's products and services, searching, form filling, online enquiry, ordering, booking, etc.	
4	Transactive Stage	Here an enterprise can buy and sell online	
5	Integrated Stage	We have reached a stage that allows for online transactions and online payments. We have reached a stabilized stage with an advanced website that supports all business processes, connected online with suppliers and business partners and handles processes such as Supply Chain Management, Customer Relationship Management, etc	

% of business from Internet: ☐ Zero%   ☐ Below 10%

☐ 10-30%   ☐ 30-50%

☐ Above 50%

(via emails/Website)

Length of e-Commerce   ☐ Not in use   ☐ less than 1 year

Adoption: ☐ 1-2 years   ☐ 2-5 years

(Starting from use of e-mails)   ☐ Above 5years

PLEASE CHOOSE THE RIGHT OPTION BELOW DEPICTING THE FUNCTIONS THAT ARE PERFORMED OR ARE PLANNED TO BE PERFORMED ELECTRONICALLY IN FUTURE IN YOUR ORGANIZATION.

Business Functions	In Use	Not in Use	Plan to use in future
Online Research on consumers' preferences			
Online Research on suppliers			
Online Product and Market Research			
Sending and Receiving BUSINESS e-Mails			
Advertising products and services on company's Website			
Using Third Party Websites for promoting your business			
Online Frequently Asked Questions			
Receiving customer feedback online			
Receiving orders from customers online			
Selling products and services online			
Tracking Incoming and Outgoing goods online			
Use of credit or smart cards for business			
Electronic Funds Transfer (EFT)for business			
Customer Relationship Management			
Supply Chain Management			

INDICATE USING TICK MARKS, HOW THE FOLLOWING FACTORS AFFECT YOUR DECISION TO ADOPT e-COMMERCE AT FIRST STAGE OR TO THE NEXT HIGHER STAGE (IF ALREADY IN USE). EC STANDS FOR e-COMMERCE.

RELATIVE ADVANTAGE

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
EC increases profitability					
EC improves the market share for products and services					
EC provides better access to information					
EC improves job performance					
EC provides new business opportunities					
EC is cost efficient					
EC saves time and efforts					

COMPATIBILITY

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
EC fits with our type of business					
EC is compatible with our existing IT infrastructure					
EC is compatible with the values of our business					
EC fits with the culture of our organization					
EC is compatible with our work practices					

COMPLEXITY

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Use of EC is not easy for our employees					
It takes a long time to learn using EC					
Use of EC is not easy for parties (suppliers and customers) related to the organization					
EC requires different skills					

TRIALABILITY

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Trialability option helps in deciding to adopt EC					
Trialability options improves the confidence to adopt EC					
Nothing much will be lost in trying EC, even if found not useful					

OBSERVABILITY

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Observing others using EC actively will help us in its adoption					
Observing others benefitting from EC use will help us in its adoption					
The more the benefits of EC can be communicated to others the more will be its adoption.					

COST

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Cost of ICT (system, applications, etc.) for EC is not affordable					
Cost of EC installation is high					
Cost of Training is expensive					
Cost of maintenance and updating the system is not affordable					
Cost of investment in the system is more than the expected return on investment					

SECURITY CONCERNS

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
EC lacks backing of strong cyber laws					
Lack of sufficient security for online payment and transaction					
Our firm don't want to take risk of hacking of data					
We are afraid of viruses in the use of EC					
EC is considered unreliable by the parties.					

OWNER'S CHARACTERISTICS

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Owner's awareness of EC benefits helps in its adoption					
Owner's level of education effects the adoption of EC					
Owner's innovativeness promotes use of EC					
Owner's gender effects the adoption of EC					
Owner's age effects the adoption of EC					
Owner's risk taking behavior influences the adoption of EC					

ORGANIZATIONAL E-READINESS

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Size of our firm effects the adoption of EC					
Our organization have the required IT resources					
Our organization have the required financial resources					
Our organization have required skilled human resources					
The employees of the organization are receptive to new technology					

MARKET FORCE INFLUENCE

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Majority of our Trading Partners have already adopted EC					
Our suppliers and business partners pressurizes us to adopt EC					
Changing customer preferences and lifestyle prompts us to adopt EC					
Culture of trading with EC is prevalent in market					

TECHNOLOGY VENDOR SUPPORT

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Experienced technology vendors for developing EC applications are available us.					
We get sufficient support of technology vendors for EC adoption					
Technology vendors provide us quick solutions of problems when needed.					
Timely technical advice given by vendors intensifies the EC adoption					
Technology vendors provide relevant information to us					

COMPETITIVE PRESSURE

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Intensity of competition is compelling us to adopt EC					
Enterprises adopting EC become more competitive					
Use of EC by our competitors influence us to adopt it					
Benefits derived by our competitors from EC prompt us to adopt it					
Pressure from dominant players improves EC adoption					

NATIONAL E-READINESS

Items of Survey	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Government is providing us adequate support for improving EC adoption					
Telecommunication infrastructure is adequate					
Power Supply is smooth and sufficient to adopt EC					
e-financial system is good and reliable					
Transport and Delivery support for EC is satisfactory					
Number of Internet service providers is sufficient					

LIST OF PUBLICAITONS

The following papers have been published or accepted for publication and thereby fulfilling the minimum programme requirements as per the UGC.

S. No.	Title of Paper with Author Names	Name of Journal / Conference	Published Date	ISSN No./ Vol. No., Issue No.
1.	Determinants of e-Commerce adoption in Small and Medium Enterprises: A literature derived model for developing nations. Dr. Pawan Kumar Ms. Harpreet Kaur	Int. J. of Business Information Systems	Accepted for publication 5th Jan, 2019 and the current status is : Entering the publication schedule	ISSN: 1746-0980 (online) 1746-0972(Print)
2.	Barriers to e-Commerce adoption: A Stage oriented model for SMEs in developing nations Dr. Pawan Kumar Ms. Harpreet Kaur	Our Heritage	10th Dec, 2019	ISSN: 0474-9030 Vol: 67 Issue: 10